DOCUMENT RESUME

ED 069 617 SP 005 955

AUTHOR	Herrin, Alan R.; And Others
TITLE	Teacher Training In Inquiry by a Performance Contractor: A Unique Experiment In Jacksonville, Florida.
INSTITUTION	Nova Univ., Fort Lauderdale, Fla. Behavioral Sciences Center.
PUB DATE	[71]
NOTE	147p.
EDRS PRICE	MF-$0.65 HC-$6.58
DESCRIPTORS	*Inquiry Training; *Inservice Teacher Education; *Performance Contracts; Program Content; Program Descriptions; *Teacher Education; *Teaching Techniques

ABSTRACT

This study, conducted by a research team from the Behavioral Sciences Center of Nova University, investigated three features of the inservice teacher training program, connected with Project Impact in Jacksonville, Florida, which are not found in most projects involving performance contractors. First, Duval County was the first district to prepare their own Request for Proposal. Second, the contractor agreed to meet the conditions, stated by the Duval County Schools, that the teacher training program emphasize the use of inquiry techniques in teaching and that the subsequent teaching of 300 target students would be by the inquiry method. Third, this project marked the first attempt by a contractor to train locally-employed teachers to take the responsibilities for the classroom instruction. The data collected and analyzed showed the effects of the inservice program and raised several interesting questions which are listed in the study. A nine-item bibliography and appendixes are included. (Author/MJM)

TEACHER TRAINING IN INQUIRY BY A PERFORMANCE CONTRACTOR: A UNIQUE EXPERIMENT IN JACKSONVILLE, FLORIDA

By

Alan R. Herrin
Marlene Mitchell
Marvin D. Patterson
Leonard M. Weissman

Faculty Advisor: Dr. Louis J. Rubin

Nova University
Behavioral Sciences Center
Fort Lauderdale, Florida

Teacher Training in Inquiry by a Performance Contractor: A Unique Experiment in Jacksonville, Florida

by

Alan R. Herrin
Marlene Mitchell
Marvin D. Patterson
Leonard M. Weissman

Summary

A research team from the Behavioral Sciences Center of Nova University undertook a study of several unique aspects of the inservice teacher training program connected with Project IMPACT in Jacksonville, Florida. This study investigated features of Project IMPACT which are not found in most projects involving performance contractors. First, Duval County was the first district to prepare their own RFP (Request for Proposal). Second, the contractor agreed to meet the conditions, stated by the Duval County Schools, that the teacher training program emphasize the use of inquiry techniques in teaching and that the subsequent teaching of the 300 target students would be by the inquiry method. Third, this project marked the first attempt by a contractor to train locally employed teachers to take the responsibilities for the classroom instruction.

The data collected and analyzed showed the effects of the inservice program and raised several interesting questions.

ACKNOWLEDGEMENTS

The Nova Research Team would like to thank the Duval County teachers who participated in this study for their time and cooperation, Jeanette Hazouri and her staff for their cooperation, Learning Research Associates for permitting us to observe the teachers, and Dr. Louis Rubin for his advice and support during this study.

FOREWORD

Between 1969 and 1971 the United State Office of Economic Opportunity and the United States Office of Education financed a number of school programs involving performance contracting. For several reasons, the most interesting of these projects was the program carried on in the schools of Duval County (Jacksonville) Florida.

The provisions in all the performance contracting projects specified that the contractor supplying instructional services would be paid in accordance with individual student achievement. In general, selection of instructional materials, learning system and teaching method all were left to the discretion of the contractor. In short, the contractor was accountable only for the results obtained. This procedure caused concern among many educational theorists for it permitted the contractor to isolate himself from a school's broad educational goals, and it permitted him to use instructional tactics which--though effective in obtaining high pupil achievement within a narrow scope of activity--were in the long run somewhat undesirable.

The project in Duval County represented a spectacular exception. In the Jacksonville project, as in the other cases, the contractor was to be paid on the basis of gains in learning recorded by each child receiving instruction. However, in this case, the instructional materials to be used, the method of instruction, and the learning systems to be used all were specified

in advance. Perhaps of greatest interest, the contractor was required to provide inservice training of the system's teachers so that, at the conclusion of the contract, these teachers would be adept in the use of the specified materials and methods. Thus, the difficulties imposed upon the contractor were greatly compounded. But, in so doing, Duval County protected itself against the major weakness of the other performance contracting projects: that is, the contractor did not isolate himself from the school's broad educational goals.

All of these circumstances stimulated the interest of Nova University's Behavioral Science Center. The opportunity to scrutinize the general effects of performance contracting, and to evaluate the strengths and weaknesses of a highly specialized teacher inservice training program, were extraordinary.

A research team made up of four doctoral students in educational research was formed to fashion and conduct a field study designed to get at the critical questions involved. All of the team members were widely experienced in public school education. All had, as a result of their training at Nova, a rich experience in educational research. Although the study posed a number of design problems, normally the case in field research, a system for data collection and analysis was devised. The pages which follow set forth the design employed, the data obtained, and the fruits of the analytical interpretations which were made.

Louis J. Rubin

TABLE OF CONTENTS

INTRODUCTION

Description of Project IMPACT

In July, 1970, the Office of Economic Opportunity announced 5.6 million dollars in performance contracts involving 18 schools in 16 states and some 27,000 students. These figures well illustrate the interest in the concept of performance contracting, which calls for private education-technology firms to be paid only if they produce. The size of their payments is scaled to how quickly and effectively they teach basic skills and raise the grade level of low-performing children.

One performance contract, funded by the United States Office of Education, involved a program in Duval County, Florida, which operated from January to June of 1971. The program was unique in that it marked the first time that an individual school system had developed its own proposal for a performance contract. The program was also unique in that the contractor, Learning Research Associates, not only guaranteed to raise the level of the 300 pupils involved a pre-specified amount, but also trained currently employed Duval County teachers in inquiry teaching methods. Th inquiry method was to be the predominant method used in teaching the 300 pupils. The contract involved the subject areas of reading, social studies, mathematics and science at the first grade level in three Title I schools (Jacksonville Beach, A.L. Lewis and Garden City).

One feature of the current performance contracting model is that an external agency, involved with neither the contractor

nor the schools system is contracted to evaluate the effectiveness of the project. The external evaluator for the Duval County project had as its prime responsibility the monitoring of student progress during the contract term and to certify gains in student performance upon which contract payments were made.

Project IMPACT (Instruction and Management Practices to Aid Classroom Teaching) placed a heavy emphasis upon learning and using inquiry methods in first grade classrooms. Underlying the foundations of the project, the general goals were: (1) to make learning more effective by making use of inquiry teaching strategies in reading, writing, mathematics, social studies and science; and (2) to move toward a more individualized classroom environment.

A three-week workshop was conducted to train teachers in the use of inquiry teaching skills and to utilize unfamiliar, inquiry-based materials. The following were the objectives of the inservice workshop as stated in the project proposal:

1. Teachers will learn to state clearly defined purposes for each lesson with children.
2. Teachers will learn to identify and state the behavioral objectives which must be reached in order to attain the purposes of a lesson.
3. Teachers will learn to develop a teaching plan that outlines the strategies required to accomplish the objectives and purposes of a lesson.

4. Teachers will develop particular skills that demonstrate more effective classroom management in terms of more efficient use of limited time, greater interaction among students and teacher and increased participation on the part of students.
5. Teachers will learn both the "how" and "why" of those teaching strategies that develop basic cognitive skills in young children.
6. Teachers will learn techniques for analyzing their own and student performance.
7. Teachers will learn to apply their knowledge and skills in the strategies to the teaching of mathematics, reading, writing, science, and social studies and to integrate these inquiry-based strategies with the instructional materials selected for each content area.

Since officials of the Duval County Schools were interested in the changes which occurred in their teachers during the three week workshop, a team of four doctoral students from Nova University were permitted to assess the effectiveness of some phases of the teacher training program. The Nova Research Team was primarily interested in the teacher variables (both psychological and behavioral) related to inquiry, the effect the three week workshop had on these variables, and the effect of the subsequent usage and follow-up activities.

Description of Training Program

Workshop

A three week inservice training program was conducted for the ten IMPACT teachers and the ten alternates from January 11, 1971 through January 29, 1971. A complete schedule and outline of the workshop activities are shown in Appendix B.

Consultants were brought in to train the teachers in the use of inquiry teaching methods and materials in four curriculum areas. The project consultants were David Butts, Henry Cade, Lyle and Sydelle Ehrenberg, John Trivett and Guy Gattegno. Primary emphasis during the workshop was given to inquiry learning and to problem solving activities in the classroom. Three basic training techniques were used during the workshop: (1) demonstrations of use of materials and teaching strategies by the consultants; (2) teachers working in teams with other teachers using the materials and strategies; and (3) teachers working with groups of children using the materials and strategies.

Follow-Up Activities

During the four months following the workshop, consultants visited the schools one or more days each month to reinforce the basic ideas and skills developed during the three week workshop.

OBJECTIVES OF THE STUDY

The Nova Research Team identified five major areas of teacher change which should occur as a result of the inservice training:

1. changes in the knowledge of and use of basic inquiry techniques;
2. changes in the creative behavior of the teachers;
3. changes in the teachers' attitudes toward inquiry teaching;
4. changes in the teachers' concept of the ideal child, and
5. changes in actual inquiry teaching behaviors in the classroom.

SELECTION OF INSTRUMENTS

Rationale

Selection of instrumentation to measure teacher changes in the five areas listed above was based upon the definition of inquiry posited by Dr. Gerald Baughman (1970), director of curriculum for the Jacksonville Schools. Inquiry is defined as "scientific heuristics", or as a method of education in which a pupil is trained to find out things for himself. It teaches how to ask questions and how to organize knowledge. John Dewey, around the turn of the century, used the term "reflective thinking" to describe the process referred to as inquiry in which a person carefully considers beliefs and knowledges in the context of supporting evidence and makes inferences from this evidence. More recently, a variety of terms have been used to describe inquiry: the inductive method, conceptual learning, creative thinking, the scientific method, "scientific heuristics", and problem solving. Selection of instrumentation was made in consideration of inquiry behaviors suggested by these terms.

The Mid-Continent Regional Educational Laboratory (McREL) has conducted extensive studies of the process of inquiry (McREL, 1969). For the purposes of their work, McREL has defined inquiry as behavior which is characterized by a careful exploration of alternatives in seeking a solution to a problem. The definition implies the following behaviors in varying

degrees: (1) becoming sensitive to and formulating problems from some type of observations such as reading, data collection, etc.; (2) actively seeking regularities and making guesses or hypotheses concerning the problem; (3) testing and retesting the hypotheses through data collection, reading, discussion, etc.; and (4) communicating the results.

The definition of inquiry is very similar to the definition of creative thinking used by E. Paul Torrance. The following quotation from Torrance (1966) illustrates the similarity:

> *...the author defines creativity as a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them, and finally communicating the results. This definition describes a natural human process. Strong human needs are involved in each stage. If we sense some incompleteness or disharmony, tension is aroused. We are uncomfortable and want to relieve the tension. Since habitual ways of behaving are inadequate, we begin trying to avoid the commonplace and obvious (but incorrect) solutions by investigating, diagnosing, manipulating, and making guesses or estimates. Until the guesses or hypotheses have been tested, modified, and retested, we are still uncomfortable. The tension is unrelieved, however, until we tell somebody of our discovery.*

Based upon the similarity of definitions, it appeared to the Nova Research Team that two tests developed by Torrance could be useful in measuring aspects of inquiry. The first, Torrance's

Test of Creative Thinking (TTCT), which measures the subjects' abilities in the area of creativity could measure the subjects ability in inquiry. The second Torrance test, What is an Ideal Child? (WIC) is claimed by Torrance to measure teacher attitudes toward the traits and behaviors characteristic of creative students. The Nova Research Team hypothesized that the WIC would likewise measure teacher attitudes toward the traits and behaviors characteristic of inquiring students.

The teacher's influence in the learning of inquiry skills is important. Evidence indicates that the inquiring individual probably will not develop in a teacher-centered and teacher-dominated learning environment (Jenkins, 1960; McREL, 1967; ERIE, 1970). The learning environment should be styled and structured in such a way as to encourage meaningful and autonomous inquiry. It is also doubtful whether a teacher who does not value inquiry can successfully produce inquiring students even if the teacher "knows the methods" of inquiry. The "newer" science programs which stress the inquiry approach have in general been unsuccessful in making the desired impact on science education (ERIE, 1970). ERIE researchers state that they have observed that teachers generally do not behave in a manner consistent with the effective utilization of these programs. It seems imperative that the teacher have a positive attitude or affect toward inquiry as well as understanding the principles of the process.

The following teacher variables have been identified as related to inquiry: teacher attitudes (the teacher's concept of a child's ideal inquiry behavior and his attitudes toward inquiry teaching); ability factors (the teacher's ability to use information, make hypotheses and go beyond the data to make predictions, and the ability to use inquiry skills in problem solving); and, overt behaviors (as demonstrated by the teacher's classroom behavior).

Instruments

Five research instruments were used in this study to assess the three dimensions of a teacher's inquiry behavior (see Appendix A for instruments developed for this study):

1. What is an Ideal Child? (WIC)

The 62 items in this test were first identified by E. Paul Torrance as being useful in measuring teacher attitudes toward the traits and behaviors characteristic of creative students (Torrance, 1965).

The list of items was submitted to a panel of 10 judges qualified as experts in the area of inquiry.* The judges were asked to rank the items according to their importance as traits of the inquiring student. The responses of the judges indicated, that in their opinion, the items could be used to measure part of the domain of inquiry, and it was therefore possible to rank the items on a continuum.

*The judges were all Ph.D.'s or doctoral students in science education or educational research. All had teaching experience and had studied in the area of inquiry.

The teachers' responses to the WIC were scored in two ways. In the first method, the responses to the items were scored as +2 for the response "especially important", +1 for the response "generally desirable", and -1 for the response "undesirable." The item scores were then summed to produce a total score. In the second scoring method the rankings of the 62 items by the groups of teachers were compared to the item rankings by the judges to produce rank order correlations.

2. Ideas About Teaching (IAT)

This is an experimental instrument developed by the Nova Research Team to measure teachers' acceptance of 12 inquiry behaviors. Based on the previously discussed concept of inquiry, the Nova Research Team listed 12 classroom behaviors that facilitate and encourage student inquiry. Twelve statements were formulated from these behaviors to determine teacher attitudes toward teacher-student interaction conducive to inquiry. The questionnaire yields a composite score which is the sum of the responses on a five-point, Likert-type, agree-disagree scale.

3. Torrance Tests of Creative Thinking (TTCT)

Verbal Tests, Forms A and B were used. This instrument purports to measure the person's ability to "think up new ideas, use...imagination and solve problems" (Torrance, 1966, p. 5). The subtests of the verbal form are: asking, guessing causes, guessing consequences, product improvement, unusual uses, unusual questions, and just suppose. Three scores are derived for each

subtest: fluency, flexibility and originality. In addition, a composite score is obtained which is the sum of the three subtest scores.

4. Processes Of Problem Solving (POPS)

This instrument is the Processes of Science Test developed by the Biological Sciences Curriculum Study (1962). The name was changed in this study to be less threatening to teachers having little training in science. It purports to measure the subject's ability to use inquiry skills in solving problems by using available data and making inferences by going beyond the data given. The test yields a composite score which is the number of correct responses.

5. Teacher Practices Observation Record (TPOR)

This instrument was developed by Brown, et al. (1968). It purports to measure a teacher's overt "classroom behavior by systematic observation. It attempts to measure agreement-disagreement of teachers' observed classroom behavior with educational practices advocated by John Dewey in his philosophy of experimentalism (Brown, et al., 1968, p. 1)." This instrument was adopted because it required little observer training for acceptable use and also appeared useful for measuring observable classroom inquiry-related behaviors. Seven TPOR scale scores are obtained: A. Nature of the situation; B. Nature of the Problem; C. Development of Ideas; D. Use of Subject Matter; E. Evaluation; F. Differentiation; G. Motivation, Control. In addition, a total TPOR score is obtained by summing the seven scales.

THE SAMPLE

Description of Sample

Thirty elementary teachers in the public schools of Duval County, Florida participated in this study. All thirty participants were female. The ages ranged from less than 25 years to more than 55 years, with the median age being between 36 and 40 years. Years of teaching experience ranged from less than one year to 31 years, with the median years of teaching experience being between 5 and 10 years. Twelve of the teachers were black and eighteen were white. All teachers held at least a bachelor's degree and were certified to teach in the State of Florida.

Selection of Sample

The sample of thirty teachers was selected by Duval County school administrators. The ten IMPACT teachers and ten alternates to be trained by the prime contractor were selected by the following criteria:

1. willingness to participate,
2. flexibility,
3. capacity for innovation,
4. desire to be trained in scientific heuristics, and the
5. ability to become skilled in teaching via the inquiry method.

The other ten teachers were selected primarily on their willingness to participate in the study herein reported.

RESEARCH DESIGN

Constraints on the Design

Several aspects of the Duval County Project placed constraints on the research design and the statistical methods which could be used to analyze the data. First, the size of the sample was small. The study began with 30 teachers in three groups: ten workshop participants, ten workshop observers, and ten teachers not connected with the workshop. Second, the selection of teachers for the three groups was not on a random basis from the population of teachers in Duval County, nor were any special attempts made to form matched groups based on relevant criteria.

It should, of course, be kept in mind that the primary purpose of Project IMPACT involved the raising of the academic achievement level of the students involved. The achievement of this purpose was not dependent upon the conditions of random sampling or matched groups of teachers. The assessment of the teacher changes which occurred during Project IMPACT was an independent study, outside of the conditions of the performance contract. Therefore, while it was an unfortunate circumstance that the teacher sampling procedures were not better suited to the needs of this assessment, it is the task of the researcher to make the best of those conditions over which he has no control.

A third constraint placed upon this study was that the study should not in any way interfere with the teacher training

workshop or the subsequent inservice training of the teachers. For example, time for assessments related to this study could not be taken from the workshop or the teacher's instructional time during the period from the end of the workshop in January to the end of school in June. Therefore, all testing of the teachers was conducted after regular school hours. The contractor did grant permission for the Nova Research Team to make observations in the Project classrooms on three occasions.

Another constraint placed upon the research design was that the number of observers was small, the four members of the Nova Research Team, and therefore it was not possible to make observations in the classrooms of all 30 sample teachers during each of the three observation sessions. Observations of classroom behaviors could be made only on the ten Project IMPACT teachers during each observation session.

The first two constraints, small sample size and lack of randomness in sampling, place severe limitations on the generalizations which may be reached from this study. It should therefore be emphasized that the results of this study are largely descriptive of the teachers and circumstances of Project IMPACT and may or may not be generalizable to other teachers in other such projects.

Design

The design was formulated with the basic purpose of assessing teacher changes in inquiry related attitudes, abilities, and

behaviors over the period of the teacher training workshop and the subsequent inservice training. Due to the previously discussed sampling limitations, the use of a design allowing inferential, group statistical techniques seemed inappropriate. Therefore, the design utilized descriptive techniques.

Three groups of teachers were specified:

1. The group of 10 teachers who actually participated in the teacher training workshop and continued in the Project IMPACT Program to its completion in June were designated as the P (Project IMPACT) Group.

2. The group of 10 teachers who were observers during the workshop but returned to their previous classroom situation (Non-Project IMPACT) for the remainder of the school year were designated as the O (Observer) Group.

3. The group of 10 teachers who had no formal contact with Project IMPACT at any time were designated as the NP (Non-Project IMPACT) Group.

The data collection techniques fell into three catagories: (1) paper and pencil testing of the teachers to measure inquiry related abilities and attitudes; (2) observation of teacher-student interaction in the classroom related to behavioral aspects of inquiry; and (3) informal interviewing of the teachers related to their experience in Project IMPACT. The instruments used in the data collection have been described in a previous section of this report.

The paper and pencil instruments were administered to all three groups at the same time. Coded identification numbers were used to assure anonymity of the teachers. Only group P was included in the classroom observations. While the primary concentration of the informal interviews was on group P some teachers from groups O and NP were also interviewed.

The paper and pencil testing and the classroom observations were conducted three times during the term of the performance contract: once on January 5 and 6, preceding the teacher training workshop; once on February 16 and 17, following the workshop; and once on May 5 and 6. The informal interviewing was not precisely scheduled and took place with some teachers during each period of testing and observation. All P Group teachers were informally interviewed during the last observation period in May.

The sequence of events in each of the three assessment periods took part of two days. The teachers were asked to assemble for testing at the Duval County School offices in Jacksonville at 3:30 p.m. on the scheduled days, that is, January 5, February 16 and May 5. The testing lasted until about 5:00 p.m. and included the Test of Creative Thinking and the Processes Of Problem Solving in each session. The teachers then took the remaining paper and pencil instruments home to be completed and returned to their respective school offices the following day. The instruments taken home included the "Teacher Biographical Information" form, taken only on the first round of testing and the instruments,

"What is an Ideal Child" and "Ideas About Teaching", both given on all three rounds of testing. The instruments returned to the school offices were then forwarded to the Nova Research Team.

Teachers absent from a testing session were given the tests by school personnel at a later date under conditions approximating the group testing session.

The classroom observations were conducted in the rooms of the 10 group P teachers on the day after each testing session, that is, on January 6, February 17, and May 6. Teachers made no special preparation for these observations. The 10 group P teachers were divided between the three target elementary schools, A.L. Lewis, Garden City, and Jacksonville Beach. All observations were conducted by the four members of the Nova Team, with one observer in each of the three schools and one observer traveling between schools and observing in all three schools during each observation period. The observers switched schools on each of the three observation periods so that each observer was in each of the three schools at least once during the three observation periods.

The informal interviews were conducted by the Nova Team members at any opportunity before or after the testing sessions and before school, during lunch periods or after school on observation days.

ANALYSIS OF RESULTS

Ideas About Teaching (IAT)

The test results from the instrument, Ideas About Teaching (IAT) are given in Table 1 and Figure 1. The observer group produced a higher mean score on the IAT in all testing sessions than the other two groups. Figure 1 indicates that the P Group and the O Group produced a greater rate of change in mean scores over time than did the NP Group. This can be seen by the steeper slopes of the P and the O Groups.

The means and standard deviations for each groups' test scores are listed in Table 1. The change in variability over the three test sessions among those who received the workshop treatment is notable. Among the P Group and O Group there was a tendency to start the project with a small deviation about the mean, produce the greatest deviation immediately after the workshop, but then decrease this deviation by the third test session. In other words, variability in workshop participants' ideas about teaching was greater immediately after the workshop than it was prior to the training or five months afterward.

Processes Of Problem Solving (POPS)

Table 2 and Figure 2 summarize the test results for the instrument, Processes Of Problem Solving (POPS). The chief pattern evident in these results may be seen in Figure 2 wherein the raw scores of the P Group are consistantly lower than the other groups.

Only the O Group produced gains in mean scores across all test sessions.

Table 2 gives the means and standard deviations for the POPS. The standard deviations of test scores showed gradually increasing variance among P and NP Groups. In contrast, the O Group had the lowest standard deviations and furthermore, these decreased over time.

TABLE 1

Means and Standard Deviations for
Ideas About Teaching Instrument

	Test 1		Test 2		Test 3	
	M	S.D.	M	S.D.	M	S.D.
Project (P Group)	42.1	3.6	47.0	6.6	48.7	3.5
Observer (O Group)	45.7	6.6	48.3	7.2	49.2	4.7
Non-Project (NP Group)	42.2	8.5	42.5	5.9	42.9	7.4

TABLE 2

Means and Standard Deviations for
Processes Of Problem Solving Instrument

	Test 1		Test 2		Test 3	
	M	S.D.	M	S.D.	M	S.D.
Project (P Group)	25.7	7.3	23.4	9.9	24.3	10.6
Observer (O Group)	26.8	5.3	28.0	4.5	30.6	3.5
Non-Project (NP Group)	27.8	6.5	29.5	7.6	28.5	8.1

Figure 1: Ideas About Teaching (IAT)

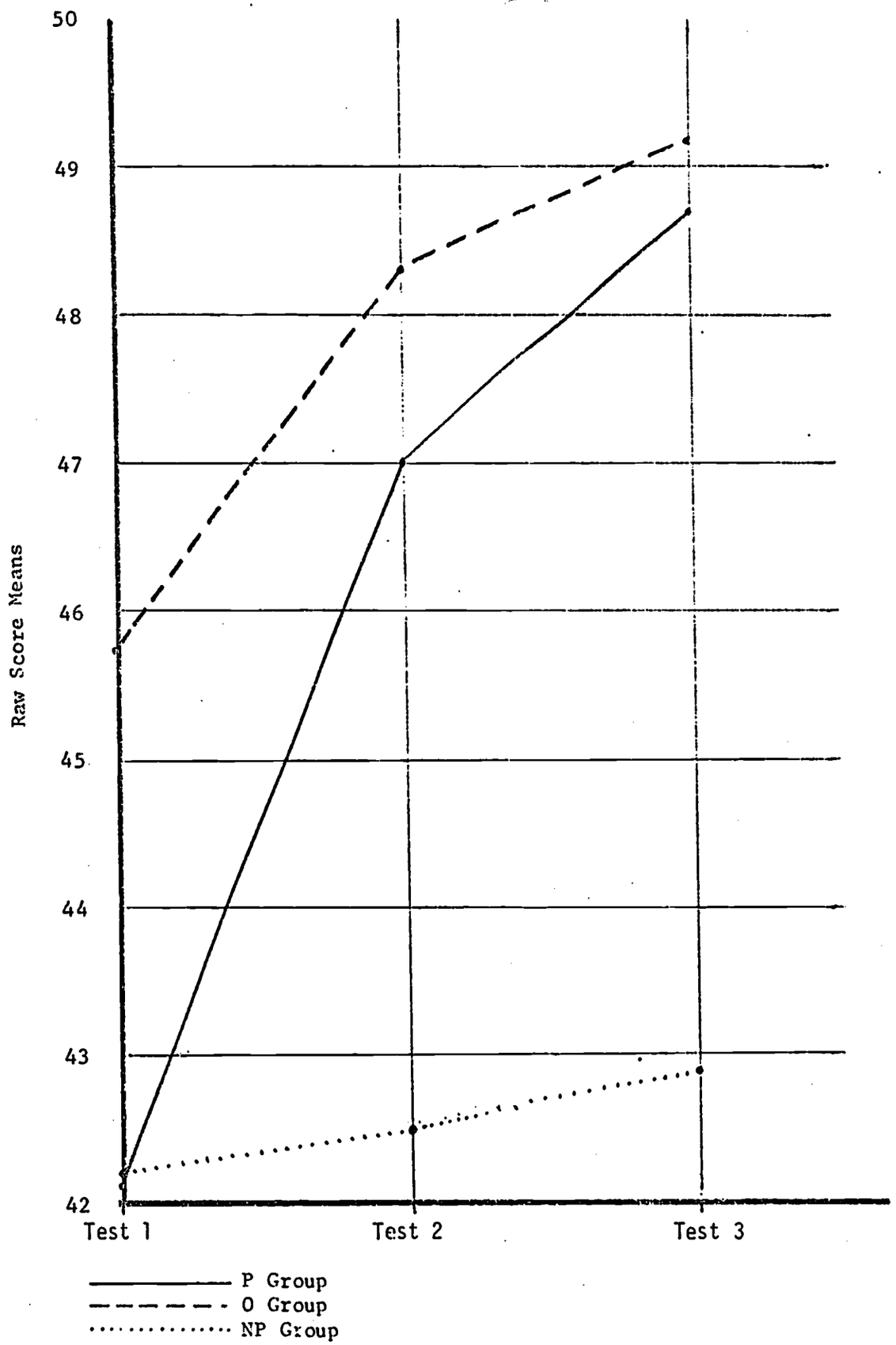
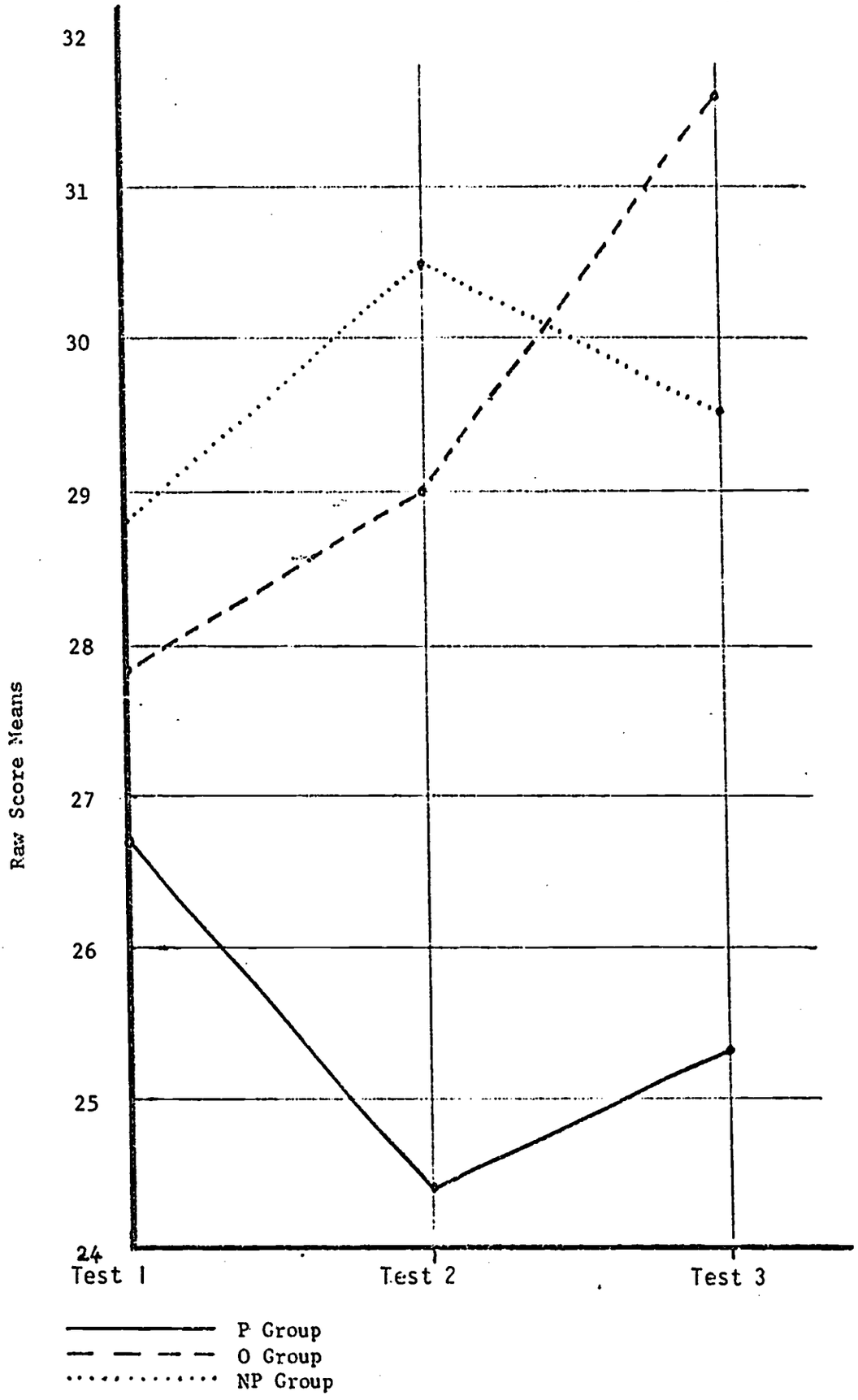


Figure 2: Processes of Problem Solving (POPS)



Torrance Tests of Creative Thinking (TTCT)

The test results from the instrument, Torrance Tests of Creative Thinking, are given in Table 3 and Figure 3. The O Group had the lowest mean score initially and the highest mean score at the end of the third testing session. The NP Group also showed a constant increase in mean score from testing session one to testing session three; however, the P Group showed a marked decrease in mean score from the first to the second testing session, but increased from the second to the third session to a point beyond which they initially started.

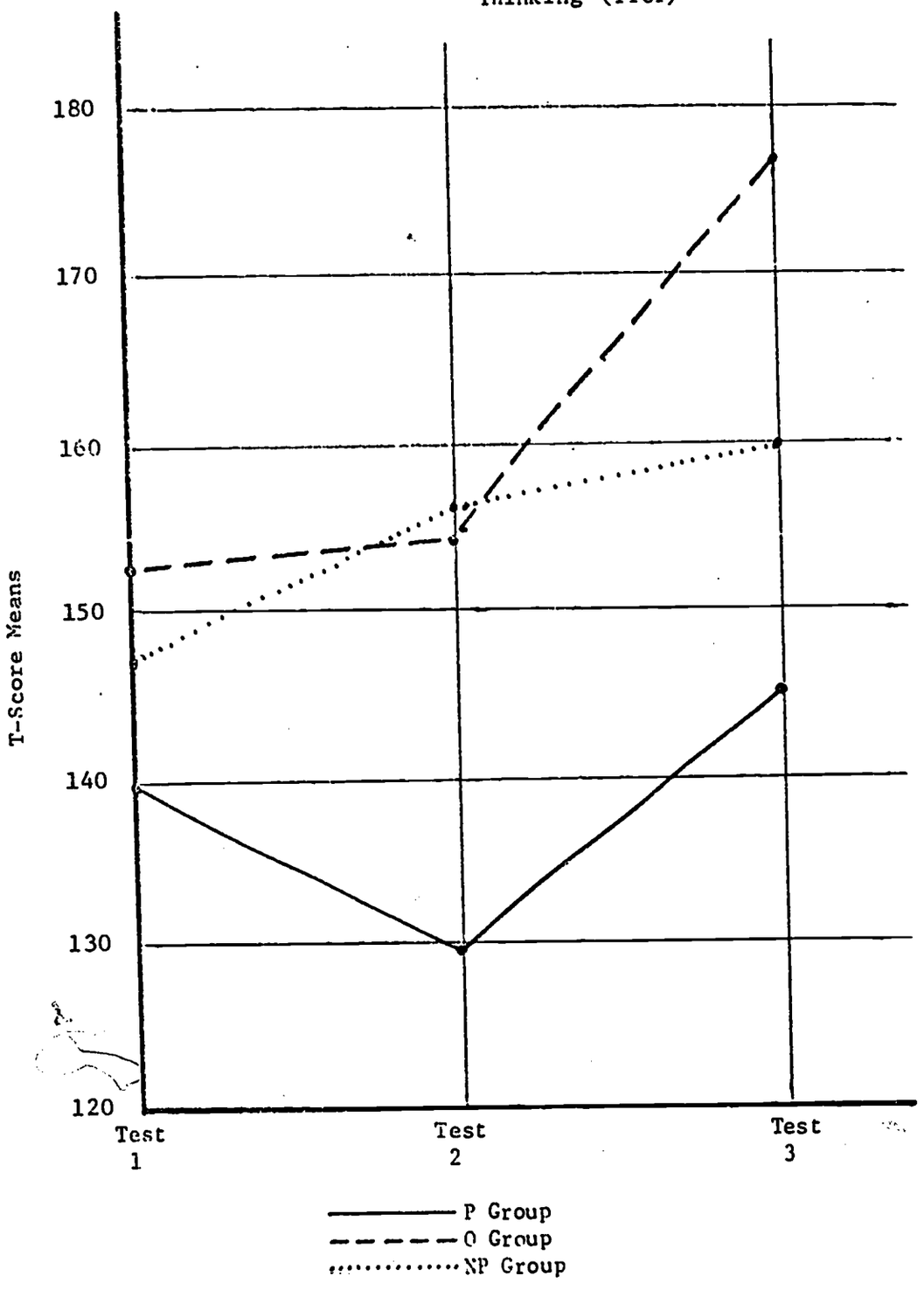
Means and standard deviations for each group's test scores are listed in Table 3. All groups decreased in variability from session one to session three. Only in the case of the O Group did their final variability remain at a level below their initial variability calculated from the first testing session.

TABLE 3

Means and Standard Deviations for
Torrance Tests of Creative Thinking

	Test 1		Test 2		Test 3	
	M	S.D.	M	S.D.	M	S.D.
Project (P Group)	139.1	21.1	129.6	14.2	145.0	36.4
Observer (O Group)	153.1	18.4	153.6	13.9	177.0	24.3
Non-Project (NP Group)	147.4	23.0	156.2	14.0	159.7	30.8

Figure 3: Torrance Test of Creative Thinking (TTCT)



What is an Ideal Child? (WIC)

The 65 items of the WIC were ranked according to their desirability to inquiry as judged by a panel of experts (c.f. Section on Selection of Instruments). For this analysis, the rankings of the items by each of the three groups of teachers were compared to the rankings of the items by the experts.

The results of the correlation analysis comparing the teachers' rankings of items to the experts' rankings of items are shown in Figure 4. The correlations with the experts' rankings for all three groups of teachers are identical on the pretest, being .48 for each group. On the second testing session, just after the workshop, the correlations indicate that the teachers taking part in the workshop as participants (P Group) or observers (O Group) are slightly more in agreement with the experts' rankings than are the NP Group which was not exposed to the workshop. The P Group correlation has risen to .50 and the O Group correlation has risen to .56 while the NP Group has risen to .49. The difference in groups becomes more pronounced on the third testing session. For that session, the P Group correlation is .54, the O Group correlation is .64, and the NP Group correlation is .41.

Further insight into the nature of the results on this instrument may be gained by examining some of the individual items. Exmainations of the top ten items in the ranking by the panel of

experts and the rankings given these same ten items by the teachers, provides information beyond that given by the correlations. Table 4 compares the rankings of these ten items for the three groups of teachers over the three testing sessions.

Items #31 (Initiative), #24 (Good guesser), #37 (Persistent), and #65 (Willing to take risks) all show rather low rankings by all three teachers' groups over all three testing sessions. All groups held a particularly low opinion of a child's being a good guesser or being willing to take risks.

Items #29 (Independent in thinking) and #28 (Independent in judgement) show patterns of change which are similar over the three testing sessions. For the P Group, these two items were ranked very high on the first and second testing sessions and then went down somewhat in the rankings on the third testing session. For both the O Group and the NP Group, these two items tended to be ranked more favorably on the second testing session than on the first. The ranking continued to increase from the second to the third testing session, with a slightly larger overall increase in ranking by the NP Groups.

Item #13 (Curious) was ranked very high by both the P Group and the O Group in all but one instance: the rank going down somewhat for the P Group on the second testing session but recovering a high position on the third testing session. This item was given a fairly high ranking by the NP Group on the first testing session, increased to a very high ranking on the second

testing session, but then decreased to a low ranking (41.5) on the third testing session.

Item #4 (Always asking questions) was ranked in the upper half of the 65 items by all groups on all testing sessions, but was not generally given very high rankings.

Some of the items not given high rankings by the judges were given high rankings by the teachers. Item #8 (Considerate of others) received consistently high rankings by the teachers, although it was ranked 44.5 by the experts. Item #26 (Healthy) also received consistently high rankings by the teachers but a 29.5 rating by the experts.

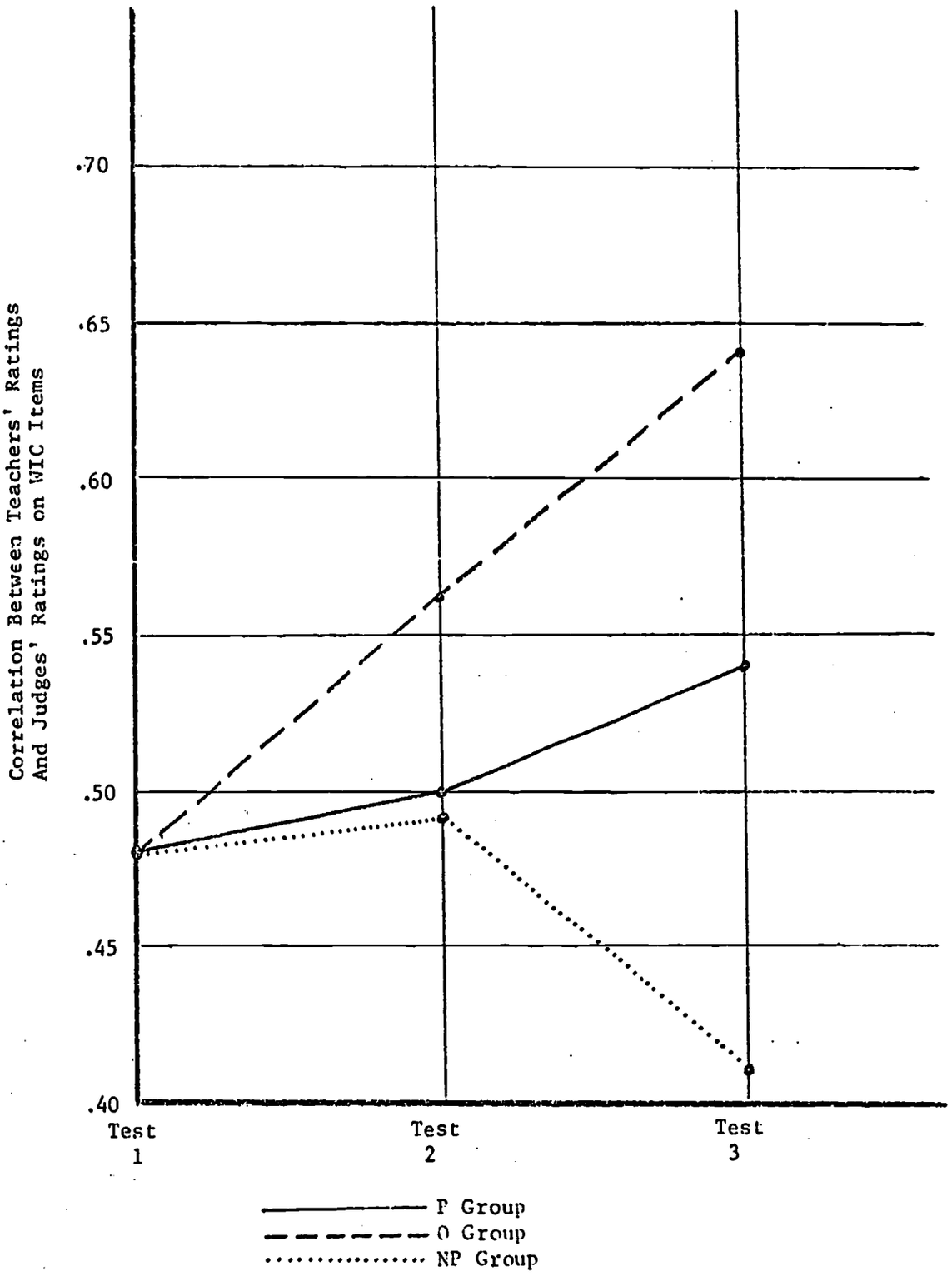
This instrument was able to detect changes in the teachers' responses due to participation in the workshop and subsequent in-service training. The O Group showed the greatest gains on this instrument. The next highest gains were made by the P Group teachers. The NP Group actually showed an overall loss on this instrument.

TABLE 4

Comparison of Rankings
of Top Ten Inquiry Items.

	Judges Ranking	P Group Test 1	P Group Test 2	P Group Test 3	O Group Test 1	O Group Test 2	O Group Test 3	NP Group Test 1	NP Group Test 2	NP Group Test 3
#31 Intuitive	1.0	35.5	14.0	22.0	25.0	41.0	27.5	29.0	35.5	46.0
#29 Independent in Thinking	2.0	7.0	1.0	11.5	1.0	4.0	1.0	14.0	5.5	13.0
#13 Curious	3.5	4.0	20.5	4.0	6.0	4.0	6.0	14.0	5.5	41.5
#48 A Self Starter	3.5	10.5	14.0	11.5	25.0	2.0	15.0	21.5	21.5	26.0
#28 Independent in Judgement	5.0	4.0	2.0	11.5	12.5	1.0	2.0	36.5	13.0	13.0
#4 Always Asking Questions	6.0	10.5	42.5	41.0	17.5	13.5	21.5	14.0	21.5	26.0
#24 Good Guesser	7.5	58.0	60.0	59.0	62.5	61.5	56.0	36.5	51.5	46.0
#37 Persistent	7.5	31.0	27.0	22.0	17.5	22.5	27.5	36.5	28.5	13.0
#5 Attempts Difficult Tasks	9.0	17.0	8.0	22.0	17.5	8.5	6.0	7.0	5.5	13.0
#65 Willing to take Risks	10.5	52.0	54.5	36.0	54.0	50.0	33.0	55.5	51.5	36.5
#27 Honest, Etc.	10.5	2.0	8.0	2.0	3.0	4.0	6.0	2.0	5.5	13.0

Figure 4: What is the Ideal Child (WIC)



Teacher Practices Observation Record (TPOR)

Table 5 shows the amount and direction of change in the seven subscales as well as of the total score of the Teacher Practices Observation Record (TPOR).

In Table 5, the column labeled Test Interval identifies the period of observation (interval 1-2, first observation to second; interval 2-3, second observation to third; interval 1-3, first observation to third). The next seven columns (A-G) identify the amount and direction of change in an individual teacher's score on that subscale of the TPOR. The last column (TPOR Tot.) shows the amount and direction of change in the teacher's total TPOR score for each test interval. For example, teacher 1 shows an increase of 11 points on scale D from the first observation to the second; thus, she demonstrated an increase of 11 points in the scale measuring Use of Subject Matter from the observation made prior to the training program to the observation made shortly after the training program.

Of the ten P Group teachers, seven obtained higher scores on the TPOR shortly after the training program. Five of the teachers showed a decrease in the TPOR score from the second to the third observation and those teachers changing in the positive direction showed only small increases.

TABLE 5

TPOR Changes

Teacher #	Test Interval	Scale A	Scale B	Scale C	Scale D	Scale E	Scale F	Scale G	TPOR Tot.
1	1-2	0	+ 8	+37	+11	+32	+12	- 6	+104
	2-3	+ 3	+ 3	- 6	+ 4	- 4	+ 5	- 1	+ 5
	1-3	+ 3	+11	+31	+15	+28	+17	- 7	+109
2	1-2	+ 2	+ 5	+13	+ 8	+19	+11	+ 7	+ 65
	2-3	-10	+ 4	-12	+ 9	-17	-14	-15	- 55
	1-3	- 8	+ 9	+ 1	+17	+ 2	- 3	- 8	+ 10
3	1-2	0	+10	- 1	-15	+17	- 1	+14	+ 24
	2-3	+ 9	- 3	- 5	+16	-13	+ 6	+ 4	+ 14
	1-3	+ 9	+ 7	- 6	+ 1	+ 4	+ 5	+18	+ 38
4	1-2	+18	+23	+ 9	+11	+20	- 7	+13	+ 84
	2-3	+ 3	- 9	-11	- 2	- 5	+12	- 7	- 18
	1-3	+21	+14	- 2	+ 9	+15	+ 5	+ 6	+ 66
5	1-2	Not Present for observation #2.							
	2-3	"	"	"	"	"			
	1-3	+16	+ 9	+42	+33	+35	+ 7	- 4	+129
6	1-2	+ 7	+ 9	+15	+ 8	+31	+ 3	+17	+ 90
	2-3	+ 9	-10	-10	- 4	-18	- 1	- 8	- 42
	1-3	+16	- 1	+ 5	+ 4	+13	+ 2	+ 9	+ 48
7	1-2	+ 2	- 8	-13	-11	-13	-13	+ 2	- 64
	2-3	-24	- 7	+ 2	- 8	+ 1	- 1	- 9	- 46
	1-3	-22	-15	-11	-19	-12	-14	- 7	-100
8	1-2	+ 5	+22	+15	+ 4	+35	+ 4	+12	+ 97
	2-3	+ 3	-20	- 6	- 4	-12	+ 1	- 2	- 27
	1-3	+ 8	+ 2	+ 9	0	+23	+ 5	+10	+ 70
9	1-2	+ 7	+25	+ 3	+11	+ 9	- 6	+20	+ 53
	2-3	+ 2	- 9	+ 9	+16	+ 4	+17	- 4	+ 35
	1-3	+ 9	+16	+12	+27	+13	+11	+16	+108
10	1-2	+ 4	- 6	-18	+ 8	+ 4	+ 1	+ 5	- 1
	2-3	Not Present for observation #3.							
	1-3	"	"	"	"	"			

The greatest positive change in the TPOR scores occurred between the first observation and the second observation. The least amount of positive change occurred between the second observation and the third observation (Table 6 and Figure 5). However, as a group, the teachers showed a positive gain from the first to the third observation period.

Figure 6 shows the correlations between the WIC and the TPOR subscales. While on the first testing session subscale D (Use of Subject Matter) obtained one of the lowest correlations (-.48) with the WIC, by the third session, the correlation was the highest of all subscales (.76). All of the subscales except G (Motivation, Control) achieved higher correlations with the WIC on the third testing session than on the first.

Subscale F (Differentiation) correlated .07, -.48 and .32 respectively with the WIC for the three testing sessions. The lowest correlation was obtained on the second testing session.

Table 6

TPOR Means and Standard Deviations

	Mean	Standard Deviations
Observation 1 N=10	167	37.6
Observation 2 N=9	208	35.1
Observation 3 N=9	223	46.3

Figure 5: Teacher Practices Observation Record (TPOR) Means for the P Group

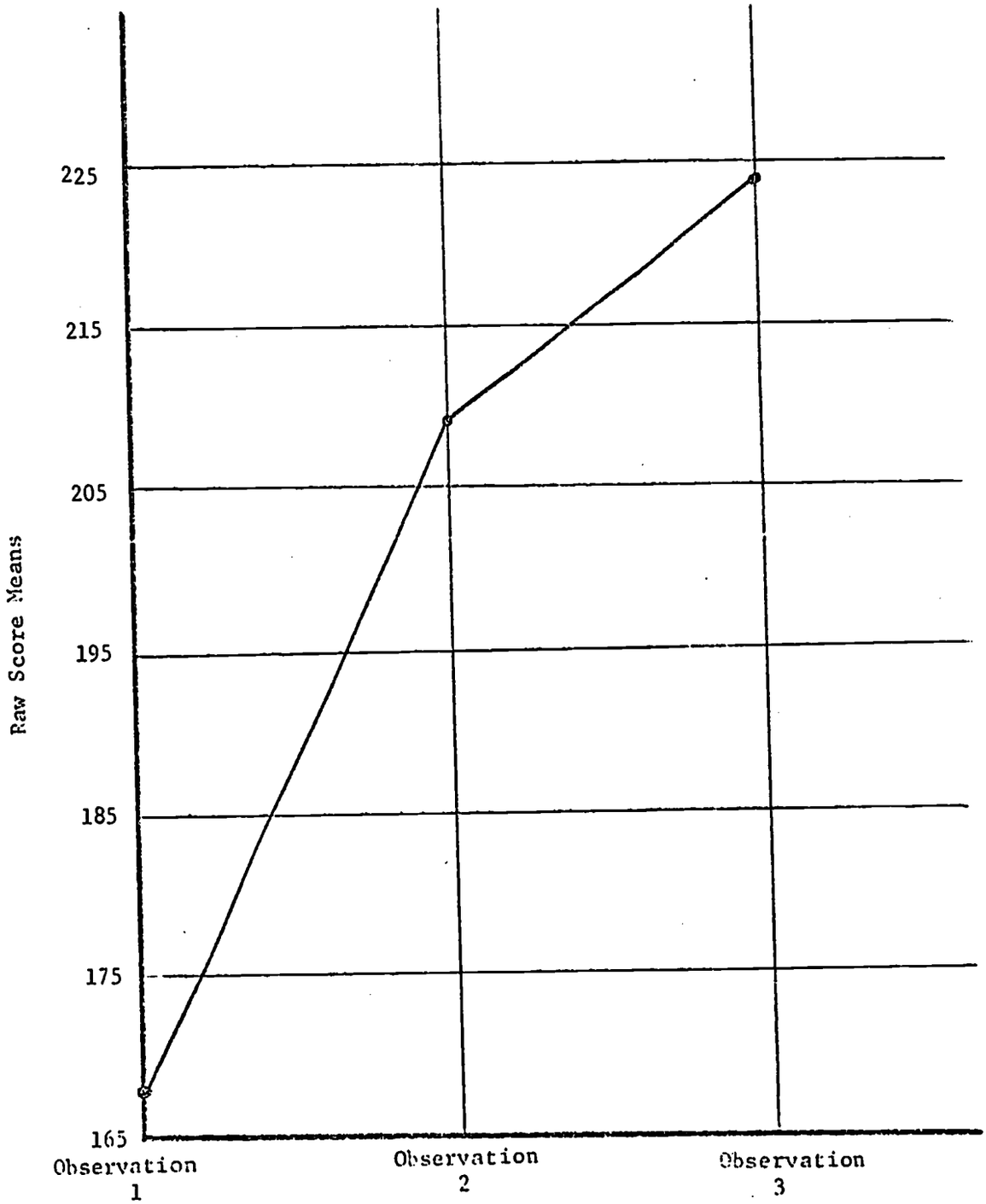


FIGURE 6

P Group Correlations Between WIC and TPOR
Subscales for Three Observation Sessions

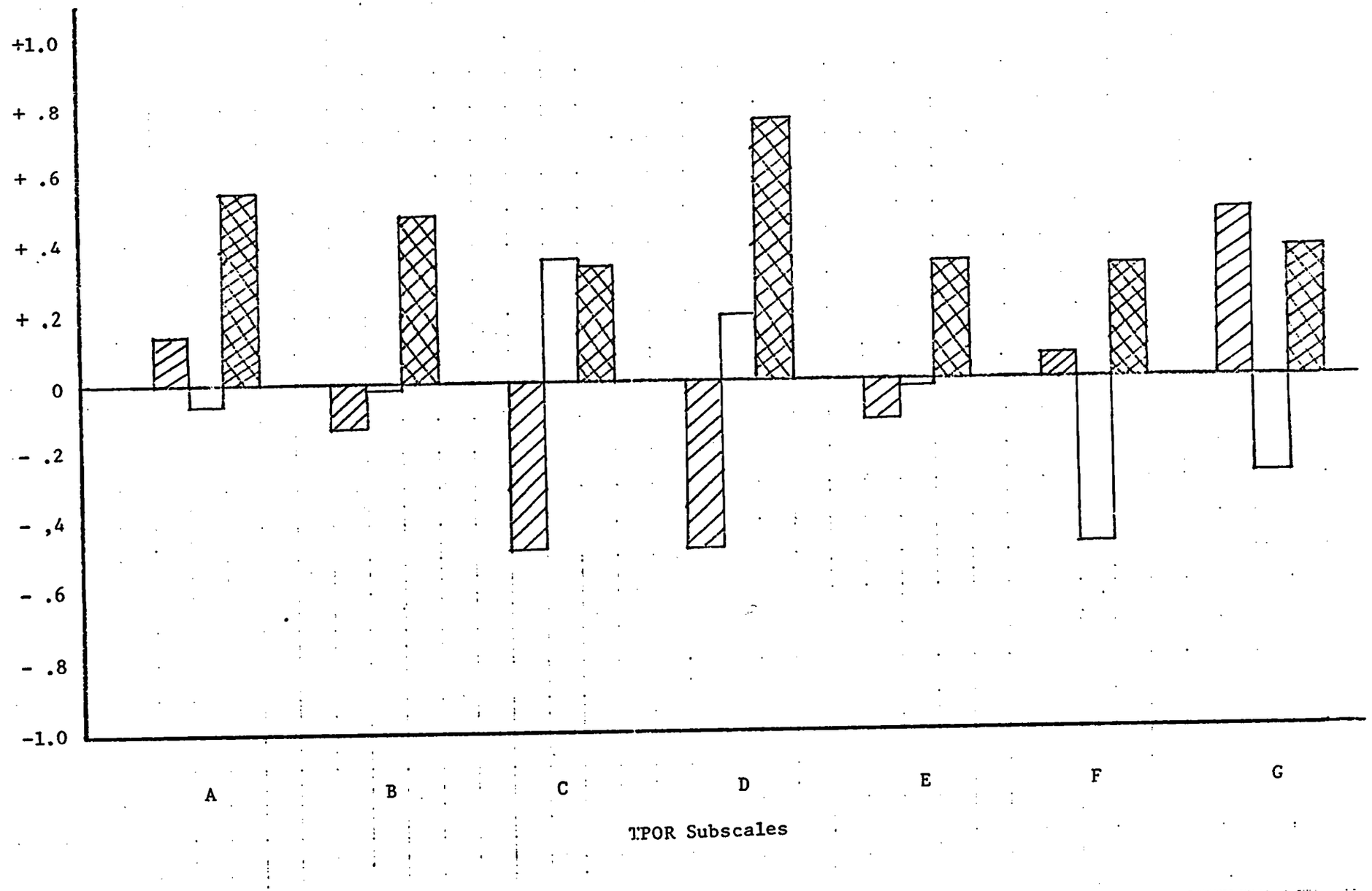


FIGURE 7
P Group Correlations Between IAT
And TPOR Subscales Over Three
Observation Sessions

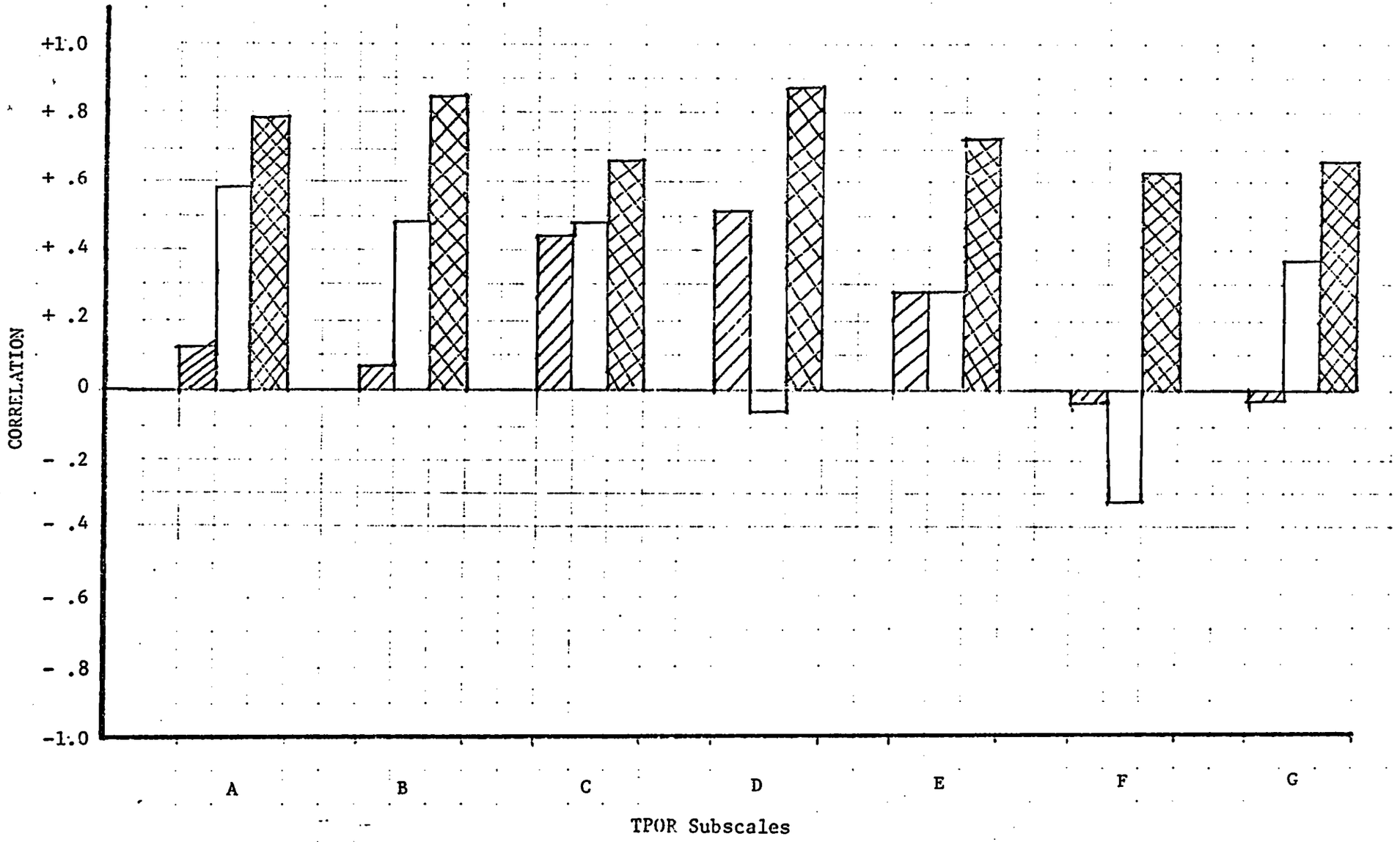


Figure 7 shows the correlations between the IAT and the seven subscales of the TPOR. As in Figure 6, the highest correlation obtained between the attitude measure (IAT) and the behavior measure (TPOR) is between subscale D and the IAT (.88). While the third testing session showed the highest correlation between subscale D and IAT, the second showed the lowest (-.05).

All subscales show higher correlations with the IAT on the third testing session than on the first.

Analysis of Instrument Intercorrelations for All Groups

Table 7 shows the intercorrelations between the POPS, TTCT, IAT, and WIC for all three test sessions. Of the six correlations possible, in every instance the correlation increased between test session one and session three. In five of the six correlations, the correlation coefficients more than doubled between the first and third test session.

The range of the intercorrelations for each test session decreased over time. The range of the first test session was between -.17 to +.45; for the second test session the range was -.08 to +.52; and finally the range for the third test session was reduced to +.45 to +.71.

The greatest increases in correlations occurred between IAT and TTCT (increasing from -.10 to +.65) and between the WIC and TTCT (increasing from -.11 to +.70). The least increase in correlations occurred between the IAT and the POPS. Here the correlation increased only from .45 to .55.

TABLE 7

Changes in Instrument
Intercorrelations Among P Group,
O Group, and NP Group

Test 1 Intercorrelations (N=30)

	POPS	TTCT	IAT	WIC
POPS	1.00	.24	.45	-.17
TTCT		1.00	-.10	-.11
IAT			1.00	.20
WIC				1.00

Test 2 Intercorrelations (N=30)

	POPS	TTCT	IAT	WIC
POPS	1.00	.39	.12	.52
TTCT		1.00	-.08	.16
IAT			1.00	.07
WIC				1.00

Test 3 Intercorrelations (N=29)

	POPS	TTCT	IAT	WIC
POPS	1.00	.71	.55	.45
TTCT		1.00	.65	.52
IAT			1.00	.70
WIC				1.00

Analysis of Instrument Intercorrelations for the P Group

Table 8 shows the intercorrelations among POPS, TTCT, IAT, TPOR, and WIC for the three testing sessions. The largest intercorrelations appear in the third testing session for the majority of the instruments. Only one correlation of high magnitude appears in the data for the second testing session between the WIC and the POPS. The highest correlation between any two instruments occurs in the data for the third testing session between the IAT and the TPOR. There appears to be a constant increase in intercorrelation from the beginning to the end of the project. The largest final change in correlation is found between the IAT and WIC. The smallest final change in correlation is found between the POPS and the TTCT.

It would appear that the variables intercorrelate to a much greater degree for the third testing session than for the other testing sessions.

TABLE 8

Changes in Instrument
Intercorrelations for P Group

Test 1 Intercorrelations (N=10)

	POPS	TTCT	IAT	TPOR	WIC
POPS	1.00	.30	.37	.27	-.21
TTCT		1.00	.27	.36	.40
IAT			1.00	.28	-.13
TPOR				1.00	-.08
WIC					1.00

Test 2 Intercorrelations (*N=10)

	POPS	TTCT	IAT	TPOR	WIC
POPS	1.00	.46	.06	-.14	.80
TTCT		1.00	-.10	.21	.46
IAT			1.00	.06	.24
TPOR				1.00	-.19
WIC					1.00

Test 3 Intercorrelations (N=9)

	POPS	TTCT	IAT	TPOR	WIC
POPS	1.00	.66	.66	.48	.54
TTCT		1.00	.79	.72	.69
IAT			1.00	.85	.81
TPOR				1.00	.50
WIC					1.00

*One teacher was not observed; therefore, the mean score for the other two observations of this teacher was assigned for purposes of analysis.

DISCUSSION OF RESULTS

Discussion of IAT Results

The effect of the workshop on teachers' ideas about teaching is demonstrated in two ways by the data (Table 1, Figure 1). First, the general increase in means on the instrument during the project indicates a greater acceptance of inquiry-oriented teaching by the 20 workshop teachers (P and O Groups). This was not true of the Non-Project Group, thus indicating that the workshop treatment had a positive effect. In addition to increased means, the fact that workshop teachers variability decreased over time could also indicate that the inservice activities had a positive effect in producing group agreement about their attitudes toward inquiry teaching. It is interesting to note that the pattern of change in the standard deviations for the NP Group is exactly the mirror image of the standard deviations produced by the workshop teachers. Thus it would appear that teacher attitudes toward inquiry teaching have changed positively as a result of the in-service activities.

Discussion of POPS Results

Specific patterns in the POPS results are difficult to discern (Table 2, Figure 2). Gains in means occurred among workshop teachers (both P and O Groups) only during the period of follow-up activities. However, the variability increased in the P Group, whereas it decreased in the O Group.

The POPS test measures the application of scientific processes among examinees. Since the processes measured are fairly sophisticated, change in teacher performance may only be slight if training was not emphasized in this area. This seems to be the case in this project where teacher sophistication in these areas was not necessarily that important to creating classroom environments that encourage student inquiry. One goal of the teacher training was that "teachers will learn to apply their knowledge and skills in the strategies to the teaching of mathematics, reading, writing, science, and social studies and to integrate these inquiry based strategies with the instructional materials selected for each content area." It is possible that a highly knowledgeable person in inquiry would not be able to meet this objective. Similarly, one who has only a basic knowledge in this area might be able to create an exciting inquiry setting. Hence, the usefulness of this instrument in this study is doubtful. The Nova Research Team had to rely more heavily on the other measures to describe the effectiveness of the inservice training in Project IMPACT.

Discussion of TTCT Results

The decrease in mean on the TTCT (Table 3, Figure 3) for the the P Group from the first to the second testing session and the large increase in mean from the second to the third testing session may indicate that there was an adjustment period needed with the new material and inquiry-related techniques in the classroom

situation. The O Group scores did not decrease on the second session. Since the O Group participated in the workshop as did the P Group, the difference in the scores between the groups may be attributed to the fact that the P Group had to adjust to using the new material and techniques in their classroom while the O Group, returning to their previous situation, did not have to make the adjustment to the new material and techniques.

The mean TTCT score reached its highest point on the third testing session possibly due to the fact that the teachers may have become more comfortable with inquiry-related techniques in the classroom and more able to apply the creative skills specified in Torrance's definition of creativity (Torrance, 1966).

There was a decrease in variability on the TTCT for all groups from the first to the second testing session. This phenomenon may be accounted for in several ways: practice effect (there was only about one month between testing sessions one and two), social desirability in answering questions the second time, and many other reasons.

During the third testing session, there was some stated dissatisfaction with retaking the TTCT. This feeling may have contributed to the increase in variability for the three groups from the second to the third testing session.

Discussion of WIC Results

The WIC was used to measure changes in teachers' attitudes toward the characteristics of inquiring students. Both groups involved in Project IMPACT, the P Group and the O Group, show attitudes which increasingly agree with the opinions of the panel of inquiry experts over the period of Project IMPACT (Figure 4). The group not involved in Project IMPACT, the NP Group, show attitudes which decreasingly agree with the opinions of the judges. In other words, the P Group and O Group appeared increasingly willing to accept the characteristics of inquiring students as Project IMPACT progressed, while the NP Group became less willing to accept these behaviors.

While there was a general increase in favorable attitude toward the inquiring student characteristics, responses on certain key items (Table 4) were not as favorable as would be desired. For example, the P Group and O Group teachers consistently indicated they valued a child's being "considerate of others" and "healthy" more highly than his being a "good guesser" or being "willing to take risks", although the latter characteristics are judged to be much more conducive to inquiry than are the former characteristics. Other key inquiry characteristics were given lower rankings than might have been desired such as "always asking questions", "persistent", "attempts difficult tasks", and "intuitive".

These item rankings by the teachers indicate that, even after the intensive training in inquiry oriented classroom methods, the teachers were still more concerned with student characteristics in the classroom which were socially desirable than behavior which was the result of student inquiry. These attitude patterns discussed above are, of course, not restricted to this sample, but are characteristic of the general population of teachers in the United States (Torrance, 1965). The comparatively higher value the teacher places on socially desirable student characteristics as compared to some, less socially desirable inquiry related characteristics is almost certain to be a factor in any attempts at implementing inquiry-oriented programs. It is doubtful whether any workshop or other training of short duration, regardless of the quality of the training, can succeed in changing teachers' attitudes to make inquiry-related characteristics more important than the more socially desirable characteristics, so long as the latter characteristics are held in higher esteem by parents and school administrators.

Discussion of TPOR Results

There were large increases on the TPOR scores for seven of the P Group teachers during the span of five weeks from the first observation to the second. However, from the second to the third observation, a span of three months, the increases were smaller in magnitude. The three months represent the follow-up and reinforcement period, during which teachers were involved in

the following activities in the classroom: use of the unfamiliar materials, use of inquiry teaching strategies, visitations by consultants, new classroom management techniques and periodic assessment of children's attainment of instructional objectives.

The finding of greater positive increases from the first to the second observation may indicate that the workshop produced desired changes in inquiry-related teacher behaviors as measured by the TPOR.* The smaller positive increase from the second observation to the third may indicate that the follow-up period, which required teacher usage of new skills and materials, may have placed the teachers under some pressure to perform in a prescribed manner.

However, the finding that, as a group the teachers showed a positive gain from the first to the third observation (Table 6, Figure 5) indicates that the total inservice activity may have produced changes in the direction of inquiry-related teacher behavior.

The pattern of correlations of the subscale D (Use of Subject Matter) of the TPOR (Figure 6, Figure 7) with the IAT and the WIC seems to indicate that a major emphasis in the workshop was placed upon the use of unfamiliar subject matter materials.

*It should be noted that for the three P Group teachers who did not show this increase, teacher #5 was not present for the second observation, #10 showed a decrease of only one point and #7 was the only teacher to show a sizeable decrease.

Subscale F (Differentiation) which deals with the use of the more individualized instructional methods shows an interesting relationship to the IAT (Figure 7). One of the stated objectives of the workshop was to encourage teachers to work toward a more individualized classroom environment. Although on the third testing session the correlation of the IAT and subscale F was the highest of the three sessions, the correlation was the lowest on the second.

The finding that subscale D showed the same correlation pattern with the IAT as subscale F. may suggest a relationship between the teachers' use of subject matter and individualization of instruction.

Teachers were already back in their classrooms for almost two weeks when the second observation was made. The low correlations just discussed could indicate that teachers may have lacked confidence in their ability to use the new materials. In addition, the pressure put upon teachers by other persons to perform well in the project may have been reflected by the TPOR. Also, all teachers had been out of their classrooms for three weeks. Some of them returned to classes they had only been with for one week prior to the workshop. It is possible that the emphasis placed on use of materials in four subject areas in the workshop, and the expectations for performance placed upon the teachers accounted for the lower correlations.

However, experience in the usage of the materials between the second and third testing sessions seems to have altered teachers' attitudes and behavior related to the use of materials and individualization of instructions to a point well above the first session.

Discussion of Instrument Intercorrelations

The increase in intercorrelations among the instruments over the three test sessions indicates the test battery is reasonably cohesive. That is to say, the level of intercorrelations suggests the instruments may be measuring aspects of the same entity or factor--a factor which the Nova Team chooses to call inquiry. Although the sample size did not meet the assumptions necessary for factor analysis, the intercorrelations do suggest that a common factor is operating across the instruments. Thus a teacher having a high creativity score in the TTCT would be expected to accept inquiry teaching strategies in the classroom, as measured by the IAT. Similar statements can be made about the apparent relationship of the other instruments.

SUMMARY AND IMPLICATIONS

This study investigated features of Project IMPACT which are not found in most projects involving performance contracting. First, Duval County was the first district to prepare their own RFP (Request for Proposal). Second, the contractor agreed to meet the conditions, stated by the Duval County Schools, that the teacher training program emphasize the use of inquiry techniques in teaching and that the subsequent teaching of the 300 target students would be by the inquiry method. Third, this project marked the first attempt by a contractor to train locally employed teachers to take the responsibilities for the classroom instruction.

Many teachers have felt threatened by the aspect of performance contracting which has been traditionally followed - that is, using personnel from outside the school system to teach the students. With a successful project for teachers who are already within a school system, performance contracting may increase in acceptance by the teaching profession since it will enable teachers to effectively teach their students by using the most current curriculum materials and the most stimulating strategies.

Were there advantages to the contractor, the schools, the teachers or the students due to the unique features of Project IMPACT mentioned above?

It is the considered opinion of the Nova Research Team that there were advantages for each of these groups due to the unique

features of Project IMPACT. The children reached an improved level of achievement but with the added advantage of having a local teacher, familiar with their backgrounds and families. The Project teachers had an opportunity for leadership positions in addition to the satisfaction of seeing students, who were chronic underachievers, achieve in an acceptable manner. The school system benefited from having its own teachers' participate in a performance contract since a turnkey process could be instituted. Teachers that have the experience, the inservice training and have tried the new methods in their classroom could train new teachers in the theory and use of materials--decreasing the net cost to the school system. It was of benefit to the performance contractor to use teachers within the system since information about the project could be more easily communicated. The contractor also received the added advantage of fostering good relations with the teaching profession.

How can the contractor train local teachers to assure project success within the unique features of his contract?

Specific training objectives had been established for Project IMPACT teachers (see Section, Selection: Sample). Was it possible to select teachers for training in specific objectives to assure maximum project success?

The contractor specified the criteria for teacher selection and the school system selected the teachers for participation in the project. The typical project teacher selected was female, had between 5 and 10 years teaching experience, was between 36 and 40 years old, was trained in elementary education, and felt her

training in the four subject matter areas to be adequate but not excellent.

The major focus in the workshop seems to have been on the use of inquiry strategies with specific subject matter materials. The use of specific inquiry-related instructional materials provided a structure in which workshop participants could develop the skills of inquiry teaching.

In assessing the inservice training program, the Nova Research Team identified three major areas of investigation: changes in teacher inquiry-related attitudes, inquiry-related abilities and inquiry teaching behaviors. The workshop seems to have had an effect on the three areas. Teacher growth in observed inquiry-teaching behavior seems to have been accompanied by growth in inquiry-related attitudes and abilities.

What characteristics of the workshop itself may have accounted for the apparent success in training teachers to use inquiry teaching methods?

Three approaches used in the workshop were apparently successful: demonstration by consultants of inquiry strategies with the new materials, use of the strategies and materials by the teachers in groups with other teachers, and then, use of the strategies and materials by the teachers with children. The follow-up activities provided continuing reinforcement to the teacher in the use of the new skills. Informal interviews with project teachers indicated, that in spite of some frustrations, they were very gratified by the responses to the new program by

children, parents and school personnel.

The Nova Research Team came away from Jacksonville with a variety of impressions. These impressions were formed not only from the observations made in the three project schools, but also from the informal conversations with teachers, administrators and project staff. As with so many innovative projects in education, the degree of satisfaction with the program's success seemed to vary from teacher to teacher. The research team felt that school climate and style of the principal's leadership might be important variables in the project - the importance of which future research should attempt to clarify.

Major changes in classroom operations were apparent over the five month period of this study. The most obvious change observable was the movement toward individualized instruction. Fewer large group lessons were observed and those that were observed had a much greater orientation toward student inquiry than before the inservice activities. Generally speaking, classroom organization moved toward an "open space" approach to instruction, that is, from teacher-centered instruction to student-centered instruction. However, much more progress could be made in this area.

The excitement generated by teachers and students working with new materials and techniques was evident in the observations. Student motivation was so high in some lessons observed that teachers seemed to have difficulty coping with student responses of increased noise levels, physical movement and individual

demands for teacher attention. Increased motivation and changed classroom settings might have been even more apparent in the observations had all learning materials and air conditioning been delivered when promised.

The unique "firsts" of Project IMPACT not only made it a pioneer in the field but also produced national visibility for its participants. Such visibility of good teaching practices is a definite strength of the project. Moreover, the turnkey features of the program expands the opportunities for teacher professional growth to take place by encouraging leadership and advancement. Both the teacher and the performance contractor benefit by cooperation in the educational endeavor. The contractor in this study was not merely an outsider coming in to do the teacher's job - he was a cooperative, supportive consultant, helping the teacher to do a better job.

SOME UNANSWERED QUESTIONS

1. Could Jacksonville have trained the teachers and achieved the desired student achievement as effectively as did the outside contractor, but at less cost?

2. How important was the selection process for the Project Teachers? Would the same results have been obtained if the Project Teachers had been randomly chosen from the teacher population of Duval County?

3. How do the teachers feel about "buying a packaged program"? i.e. how do they feel about having materials, teaching methods, and objectives dictated to them by a contract?

4. What should be the extent of the teachers' role in all phases of the performance contract, from RFP to final evaluation?

5. What training do teachers need to function in an effective manner in all phases of a performance contract as specified in the previous question?

6. Should the performance contractor be paid on the basis of teacher change as well as student change?

7. Is the contractor obligated to plan for legitimate research (for example random selection, random treatment, use of controls, etc.) into his program by an outside agency and to share successful techniques with the educational community?

8. Should performance contractors receive additional payment based upon the success of the turnkey operation, that is, a yearly bonus be paid based upon lasting, contractor produced, improvements?

9. Is an outside agent more effective than the local school system in producing changes within the schools?

REFERENCES

Baughman G. in Humphrey, B. Duval develops own school IMPACT program. Jacksonville Journal. October 19, 1970, pp. 19.

Biological Sciences Curriculum Study (BSCS). Processes of sciences test (Form A). New York: The Psychological Corp. 1962.

Brown, B., Mendehall, W. and Beaver, R. The reliability of observations of teachers' classroom behavior. The Journal of Experimental Education, 36(3), 1968.

ERIE: Cole, H. P. What is process education? An emerging rational position. Unpublished document from Eastern Regional Institute for Education, 1970.

Jenkins, D. H. The dynamics of instructional groups. 59th Yearbook, Part II, NSSE. Chicago: University of Chicago Press, 1960.

McRel: Amidon, E. J. and Flanders, N. A. The role of the teacher in the classroom. Minneapolis: Association for Productive Teaching, Inc., 1967.

McRel: Bingham, R. M. (ed.). Inquiry objectives in the teaching of biology. Kansas City: Mid-Continent Regional Educational Laboratory, 1969.

Torrance, E. P. Torrance tests of creative thinking; norms-technical manual. Princeton: Personnel Press Inc., 1966.

Torrance, E. P. Rewarding creative behavior. New Jersey: Prentice-Hall, Inc., 1965.

APPENDICES

APPENDIX A: Instruments

NOVA UNIVERSITY-DUVAL COUNTY EXPERIMENTAL RESEARCH PROJECT

Teacher Biographical Information

Name of School _____ Teacher Social Security # _____

There are a number of factors that contribute to a teacher's unique teaching style. We are interested in identifying some of these factors. We would appreciate your cooperation in completing the following items:

1. Years of teaching experience _____

2. Age: (circle one)

   20-25 26-30 31-35 36-40 41-45 46-50 51-55 56-60

3. Sex: Male _____ Female _____

4. Undergraduate major (s) _____ Institution _____

5. Undergraduate minor (s) (12 or more semester hours)

   _____

   _____

6. Highest degree obtained _____ Institution _____

7. How would you rate your preparation in these areas? (circle one)

Reading:	Excellent	Adequate	Inadequate	None
Social Studies:	Excellent	Adequate	Inadequate	None
Mathematics:	Excellent	Adequate	Inadequate	None
Science:	Excellent	Adequate	Inadequate	None

8. What does the term "inquiry teaching" mean to you? (If you need more space, please use the other side of this page.)

Name _____ School _____ NU: 71

Date _____

NOVA UNIVERSITY-DUVAL COUNTY EXPERIMENTAL RESEARCH PROJECT

Ideas About Teaching	1. Strongly Agree	2. Agree	3. Uncertain	4. Disagree	5. Strongly Disagree
1. Lively discussions are OK, but they always seem to get off the subject.	1	2	3	4	5
2. During discussions many student ideas are not useful because they do not contribute to the discussion.	1	2	3	4	5
3. The best way to teach problem-solving is to show the student how to solve problems.	1	2	3	4	5
4. Most students require teacher-guidance in their thinking.	1	2	3	4	5
5. Some students ask entirely too many questions.	1	2	3	4	5
6. During a group discussion, when a student asks a question, it is usually better for the teacher to answer it than for another student to answer it.	1	2	3	4	5
7. When several students are discussing a topic, it is important for the teacher to frequently add information and correct faulty ideas.	1	2	3	4	5
8. The student who stubbornly challenges the teacher's ideas is a real problem.	1	2	3	4	5
9. The student should be able to rely on the teacher to know the right answer.	1	2	3	4	5
10. It should be impressed upon students that guessing has no place in the classroom.	1	2	3	4	5
11. The overly curious student creates too many problems for the teacher.	1	2	3	4	5
12. Most students are incapable of finding evidence to support their ideas.	1	2	3	4	5

APPENDIX B: Schedule of Workshop Activities

Project IMPACT

In-service training schedule for Project IMPACT

Jacksonville Beach Elementary, #144

1st Week - January 11 - 15

Monday A.M.	Orientation to the week Awareness Experience - Classification Skills Analysis and Rationale for the Strategy
Monday P.M.	Tryout in teams using the teaching strategies for attending, observation and classification skills - Demonstration of the teaching strategies with children
Tuesday A.M.	Teachers try out strategies with children Discussion of tryouts Summary of the teaching strategies
Tuesday P.M.	Awareness Experience - Concept Development Analysis and Rationale for the Strategy Team Planning and Tryout of the Concept Development teaching strategy
Wednesday A.M.	Teachers tryout with children Analysis of tryouts Summary on Concept Development strategy
Wednesday P.M.	Awareness Experience - Interpretation of Data Analysis and Rationale for the Strategy Step by Step Review
Thursday A.M.	Team planning and tryout of the strategy Planning for tryout with children
Thursday P.M.	Teachers tryout with children Analysis of tryouts Summary of the Interpretation of Data strategy
Friday A.M.	Introduction to the teaching strategies for Application of Generalizations and Interpretation of Feelings, Attitudes, and Values
Friday P.M.	Introduction to the Taba Social Studies Curriculum - Analysis of the content and learning activities in the 1st grade unit

LB

Project IMPACT

In-service training schedule for Project IMPACT

Jacksonville Beach Elementary, #144

2nd Week - January 18 - 26

John Trivett - Consultant

Monday

Introduction: the approach and the Project IMPACT expectations, evaluation, objectives, discovery, cybernetic and the teacher's role, correction and non-correction, integration of all subject areas, etc.

Mathematics: use of rods for teachers' initial learning experience and its implications. Colored slides of first-grade children at work.

Reading: the first vowels and chart O.
Visual dictation No. 1
Use of the pointer

Tuesday

A. L. Lewis Elementary, #105

Math: continuation of Monday's activity with rods, free play, descriptive phases. Introduction of attribute blocks: description, sorting games, inclusion, exclusion, complement, set, subset, element, etc.

Children's Lesson: Mr. Trivett and the first reading lesson.

Mr. Trivett and free play with the rods.

Teacher's Discussion

Reading: Teachers use pointers with each other.
Vowels and consonants
Book 1
Videotape showing early lessons

Wednesday

Math: Learnings from Monday and Tuesday activity patterns, systems, strategies, concepts known, addition and subtraction, confusion and clarity, environmental clues, etc.

Set games, union and intersection, equivalence using Attribute Blocks and pebbles

Children: Mr. Trivett with children on Chart 0; writing and reading Book 1
Rods, some games in qualitative phase

Teacher Discussion

Reading: Use of Book 1
Continuation of chart work, transformation games, beginnings of writing

Garden City Elementary School, #59

Thursday

Math: Patterns the children make.
Measuring to get numbers; the 'number facts', addition and subtraction.
Written symbols
Using rods, blocks, pebbles.

Children: Teachers work with small groups of children in both reading and math with guidance.

Reading: Use of Book 2
Spelling
Workbooks, worksheets, and early transformation.

Friday

Math: Relation games
Computational aspects
+ − X and ÷
Factors and multiples
Inequalities

Children: Teachers with children on aspects arising from Thursday's work

Reading: Book of stories
Transformation games
The first 12 charts
Books 1 and 2

Third Week

Jacksonville Beach Elementary,#144

Monday	Recapitulation of beginnings in the light of what happened during previous week. Teachers spend time working with charts, with themselves and with children. Use of geo-boards in grade 1. Use of texts, work cards and word cards.
Tuesday	OPEN but must include discussion of problems of follow-up and arrangements for continuing follow-up, reporting, etc. Housekeeping details
Wednesday	Dr. David Butts - Science - A Process Approach
Thursday	Science - A Process Approach
Friday	Science - A Process Approach

12:00 Lunch

1:00 "Shapes, Shadows, and Children" (A session directed toward the teacher's background in space/time relationships.)

2:30 Informal discussion with Cokes

3:00 Decision time: Preparation for Low Ratio Teaching on Friday morning including
1) Selecting exercise
2) Planning to teach it
3) Exploration of materials needed

4:00 Adjourn

Friday, January 29

8:30 Continued preparation for Low Ratio Teaching

9:00 Low Ratio Teaching

10:00 Individual reflections on "What I learned from the last hour."

10:20 Informal discussion with coffee

10:40 Shared ideas on what the next month's activities with children should be.

12:00 Lunch

1:00 "Vegetables and Grouping" - a session directed toward teacher's background in classification

2:00 Questions and concern time

3:30 Adjourn

Jacksonville, Florida

KEY TEACHER IDEAS

A. THE STUDENT'S EXPERIENCES IN THE CLASSROOM

1. Do you let the student decide for himself rather than give him the criterion to look for?

2. Do you encourage the child to try out his suggestions rather than serve as the source of knowledge?

3. Do you let the child generate the basis of action rather than serve as the source of knowledge?

4. Do you take time to let the child grope, ponder, or mess around rather than direct him immediately to the conclusion?

5. Do you keep the children actively involved (either physically or mentally) rather than do the activity yourself?

6. Do you direct students in experiences prior to expecting analysis and meaning for words rather than presenting the vocabulary before the experience?

B. HOW THE STUDENT INTERPRETS HIS EXPERIENCES IN THE CLASSROOM

1. Do you respond to explanations with questions such as "how do you know" or "is it reasonable" rather than agree or disagree with the explanation?

2. Do you listen to student descriptions and push them for more precision rather than accept their first response?

3. Do you help students to question explanations in terms of reasonableness of their own experience rather than accept the reasonableness of your experience?

4. Do you recognize that one experience does not mean comprehension rather than assume because the point is clear to one, it is clear to all?

5. Do you select illustrations of an idea that progressively are less obvious than simpler ones rather than assuming that because the student saw the point in the simple illustration he sees it in all instances?

6. Do you make students back up and simplify complex statements so that other students comprehend rather than accept it because it sounds good or adequate to you?

C. TEACHER RESPONSES TO STUDENTS

1. Do you keep an open mind as to the student's response rather than accept only that answer you think is correct?

2. Do you direct student thinking by introducing situations that "don't fit" or that may be surprising rather than telling them that they don't see the point?

3. Do you adjust the pace of the exercise to the progress of the student rather than speed to cover it or drag to fill in the time?

4. Do you base your opinion of student performance on what you see him do rather than on what you assume he can do?

5. Do you pose questions to get students to think rather than to get the answer you think is correct?

6. Do you direct questions to the student's level rather than expect all students to operate at the same level of experience necessary to answer a question?

7. Do you probe the basis for an inappropriate response rather than tell the student he is wrong and then search for the desired response?

**DO YOU CONTINUALLY INVOLVE THE GROUP IN THE ACTIVITY BY PROVIDING OPPORTUNITY FOR THEM TO EXPRESS AN OPINION BEFORE DOING AN ACTIVITY RATHER THAN LET THE ACTIVITY BE A DEMONSTRATION MONOLOGUE BETWEEN THE TEACHER AND ONE OR TWO STUDENTS?

TEACHER TRAINING IN INQUIRY BY A PERFORMANCE CONTRACTOR: A UNIQUE EXPERIMENT IN JACKSONVILLE, FLORIDA

By

Alan R. Herrin
Marlene Mitchell
Marvin D. Patterson
Leonard M. Weissman

Faculty Advisor: Dr. Louis J. Rubin

Nova University
Behavioral Sciences Center
Fort Lauderdale, Florida

ACKNOWLEDGEMENTS

The Nova Research Team would like to thank the Duval County teachers who participated in this study for their time and cooperation, Jeanette Hasouri and her staff for their cooperation, Learning Research Associates for permitting us to observe the teachers, and Dr. Louis Rubin for his advice and support during this study.

FOREWORD

Between 1969 and 1971 the United State Office of Economic Opportunity and the United States Office of Education financed a number of school programs involving performance contracting. For several reasons, the most interesting of these projects was the program carried on in the schools of Duval County (Jacksonville) Florida.

The provisions in all the performance contracting projects specified that the contractor supplying instructional services would be paid in accordance with individual student achievement. In general, selection of instructional materials, learning system and teaching method all were left to the discretion of the contractor. In short, the contractor was accountable only for the results obtained. This procedure caused concern among many educational theorists for it permitted the contractor to isolate himself from a school's broad educational goals, and it permitted him to use instructional tactics which--though effective in obtaining high pupil achievement within a narrow scope of activity--were in the long run somewhat undesirable.

The project in Duval County represented a spectacular exception. In the Jacksonville project, as in the other cases, the contractor was to be paid on the basis of gains in learning recorded by each child receiving instruction. However, in this case, the instructional materials to be used, the method of instruction, and the learning systems to be used all were specified

in advance. Perhaps of greatest interest, the contractor was required to provide inservice training of the system's teachers so that, at the conclusion of the contract, these teachers would be adept in the use of the specified materials and methods. Thus, the difficulties imposed upon the contractor were greatly compounded. But, in so doing, Duval County protected itself against the major weakness of the other performance contracting projects: that is, the contractor did not isolate himself from the school's broad educational goals.

All of these circumstances stimulated the interest of Nova University's Behavioral Science Center. The opportunity to scrutinize the general effects of performance contracting, and to evaluate the strengths and weaknesses of a highly specialized teacher inservice training program, were extraordinary.

A research team made up of four doctoral students in educational research was formed to fashion and conduct a field study designed to get at the critical questions involved. All of the team members were widely experienced in public school education. All had, as a result of their training at Nova, a rich experience in educational research. Although the study posed a number of design problems, normally the case in field research, a system for data collection and analysis was devised. The pages which follow set forth the design employed, the data obtained, and the fruits of the analytical interpretations which were made.

Louis J. Rubin

TABLE OF CONTENTS

INTRODUCTION

Description of Project IMPACT

In July, 1970, the Office of Economic Opportunity announced 5.6 million dollars in performance contracts involving 18 schools in 16 states and some 27,000 students. These figures well illustrate the interest in the concept of performance contracting, which calls for private education-technology firms to be paid only if they produce. The size of their payments is scaled to how quickly and effectively they teach basic skills and raise the grade level of low-performing children.

One performance contract, funded by the United States Office of Education, involved a program in Duval County, Florida, which operated from January to June of 1971. The program was unique in that it marked the first time that an individual school system had developed its own proposal for a performance contract. The program was also unique in that the contractor, Learning Research Associates, not only guaranteed to raise the level of the 300 pupils involved a pre-specified amount, but also trained currently employed Duval County teachers in inquiry teaching methods. The inquiry method was to be the predominant method used in teaching the 300 pupils. The contract involved the subject areas of reading, social studies, mathematics and science at the first grade level in three Title I schools (Jacksonville Beach, A.L. Lewis and Garden City).

One feature of the current performance contracting model is that an external agency, involved with neither the contractor

nor the schools system is contracted to evaluate the effectiveness of the project. The external evaluator for the Duval County project had as its prime responsibility the monitoring of student progress during the contract term and to certify gains in student performance upon which contract payments were made.

Project IMPACT (Instruction and Management Practices to Aid Classroom Teaching) placed a heavy emphasis upon learning and using inquiry methods in first grade classrooms. Underlying the foundations of the project, the general goals were: (1) to make learning more effective by making use of inquiry teaching strategies in reading, writing, mathematics, social studies and science; and (2) to move toward a more individualized classroom environment.

A three-week workshop was conducted to train teachers in the use of inquiry teaching skills and to utilize unfamiliar, inquiry-based materials. The following were the objectives of the inservice workshop as stated in the project proposal:

1. Teachers will learn to state clearly defined purposes for each lesson with children.
2. Teachers will learn to identify and state the behavioral objectives which must be reached in order to attain the purposes of a lesson.
3. Teachers will learn to develop a teaching plan that outlines the strategies required to accomplish the objectives and purposes of a lesson.

4. Teachers will develop particular skills that demonstrate more effective classroom management in terms of more efficient use of limited time, greater interaction among students and teacher and increased participation on the part of students.
5. Teachers will learn both the "how" and "why" of those teaching strategies that develop basic cognitive skills in young children.
6. Teachers will learn techniques for analyzing their own and student performance.
7. Teachers will learn to apply their knowledge and skills in the strategies to the teaching of mathematics, reading, writing, science, and social studies and to integrate these inquiry-based strategies with the instructional materials selected for each content area.

Since officials of the Duval County Schools were interested in the changes which occurred in their teachers during the three week workshop, a team of four doctoral students from Nova University were permitted to assess the effectiveness of some phases of the teacher training program. The Nova Research Team was primarily interested in the teacher variables (both psychological and behavioral) related to inquiry, the effect the three week workshop had on these variables, and the effect of the subsequent usage and follow-up activities.

Description of Training Program

Workshop

A three week inservice training program was conducted for the ten IMPACT teachers and the ten alternates from January 11, 1971 through January 29, 1971. A complete schedule and outline of the workshop activities are shown in Appendix B.

Consultants were brought in to train the teachers in the use of inquiry teaching methods and materials in four curriculum areas. The project consultants were David Butts, Henry Cade, Lyle and Sydelle Ehrenberg, John Trivett and Guy Gattegno. Primary emphasis during the workshop was given to inquiry learning and to problem solving activities in the classroom. Three basic training techniques were used during the workshop: (1) demonstrations of use of materials and teaching strategies by the consultants; (2) teachers working in teams with other teachers using the materials and strategies; and (3) teachers working with groups of children using the materials and strategies.

Follow-Up Activities

During the four months following the workshop, consultants visited the schools one or more days each month to reinforce the basic ideas and skills developed during the three week workshop.

OBJECTIVES OF THE STUDY

The Nova Research Team identified five major areas of teacher change which should occur as a result of the inservice training:

1. changes in the knowledge of and use of basic inquiry techniques;
2. changes in the creative behavior of the teachers;
3. changes in the teachers' attitudes toward inquiry teaching;
4. changes in the teachers' concept of the ideal child, and
5. changes in actual inquiry teaching behaviors in the classroom.

SELECTION OF INSTRUMENTS

Rationale

Selection of instrumentation to measure teacher changes in the five areas listed above was based upon the definition of inquiry posited by Dr. Gerald Baughman (1970), director of curriculum for the Jacksonville Schools. Inquiry is defined as "scientific heuristics", or as a method of education in which a pupil is trained to find out things for himself. It teaches how to ask questions and how to organize knowledge. John Dewey, around the turn of the century, used the term "reflective thinking" to describe the process referred to as inquiry in which a person carefully considers beliefs and knowledges in the context of supporting evidence and makes inferences from this evidence. More recently, a variety of terms have been used to describe inquiry: the inductive method, conceptual learning, creative thinking, the scientific method, "scientific heuristics", and problem solving. Selection of instrumentation was made in consideration of inquiry behaviors suggested by these terms.

The Mid-Continent Regional Educational Laboratory (McREL) has conducted extensive studies of the process of inquiry (McREL, 1969). For the purposes of their work, McREL has defined inquiry as behavior which is characterized by a careful exploration of alternatives in seeking a solution to a problem. The definition implies the following behaviors in varying

degrees: (1) becoming sensitive to and formulating problems from some type of observations such as reading, data collection, etc.; (2) actively seeking regularities and making guesses or hypotheses concerning the problem; (3) testing and retesting the hypotheses through data collection, reading, discussion, etc.; and (4) communicating the results.

The definition of inquiry is very similar to the definition of creative thinking used by E. Paul Torrance. The following quotation from Torrance (1966) illustrates the similarity:

> *...the author defines creativity as a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them, and finally communicating the results. This definition describes a natural human process. Strong human needs are involved in each stage. If we sense some incompleteness or disharmony, tension is aroused. We are uncomfortable and want to relieve the tension. Since habitual ways of behaving are inadequate, we begin trying to avoid the commonplace and obvious (but incorrect) solutions by investigating, diagnosing, manipulating, and making guesses or estimates. Until the guesses or hypotheses have been tested, modified, and retested, we are still uncomfortable. The tension is unrelieved, however, until we tell somebody of our discovery.*

Based upon the similarity of definitions, it appeared to the Nova Research Team that two tests developed by Torrance could be useful in measuring aspects of inquiry. The first, Torrance's

Test of Creative Thinking (TTCT), which measures the subjects' abilities in the area of creativity could measure the subjects ability in inquiry. The second Torrance test, What is an Ideal Child? (WIC) is claimed by Torrance to measure teacher attitudes toward the traits and behaviors characteristic of creative students. The Nova Research Team hypothesized that the WIC would likewise measure teacher attitudes toward the traits and behaviors characteristic of inquiring students.

The teacher's influence in the learning of inquiry skills is important. Evidence indicates that the inquiring individual probably will not develop in a teacher-centered and teacher-dominated learning environment (Jenkins, 1960; McREL, 1967; ERIE, 1970). The learning environment should be styled and structured in such a way as to encourage meaningful and autonomous inquiry. It is also doubtful whether a teacher who does not value inquiry can successfully produce inquiring students even if the teacher "knows the methods" of inquiry. The "newer" science programs which stress the inquiry approach have in general been unsuccessful in making the desired impact on science education (ERIE, 1970). ERIE researchers state that they have observed that teachers generally do not behave in a manner consistent with the effective utilization of these programs. It seems imperative that the teacher have a positive attitude or affect toward inquiry as well as understanding the principles of the process.

The following teacher variables have been identified as related to inquiry: teacher attitudes (the teacher's concept of a child's ideal inquiry behavior and his attitudes toward inquiry teaching); ability factors (the teacher's ability to use information, make hypotheses and go beyond the data to make predictions, and the ability to use inquiry skills in problem solving); and, overt behaviors (as demonstrated by the teacher's classroom behavior).

Instruments

Five research instruments were used in this study to assess the three dimensions of a teacher's inquiry behavior (see Appendix A for instruments developed for this study):

1. What is an Ideal Child? (WIC)

The 62 items in this test were first identified by E. Paul Torrance as being useful in measuring teacher attitudes toward the traits and behaviors characteristic of creative students (Torrance, 1965).

The list of items was submitted to a panel of 10 judges qualified as experts in the area of inquiry.* The judges were asked to rank the items according to their importance as traits of the inquiring student. The responses of the judges indicated, that in their opinion, the items could be used to measure part of the domain of inquiry, and it was therefore possible to rank the items on a continuum.

*The judges were all Ph.D.'s or doctoral students in science education or educational research. All had teaching experience and had studied in the area of inquiry.

The teachers' responses to the WIC were scored in two ways. In the first method, the responses to the items were scored as +2 for the response "especially important", +1 for the response "generally desirable", and -1 for the response "undesirable." The item scores were then summed to produce a total score. In the second scoring method the rankings of the 62 items by the groups of teachers were compared to the item rankings by the judges to produce rank order correlations.

2. Ideas About Teaching (IAT)

This is an experimental instrument developed by the Nova Research Team to measure teachers' acceptance of 12 inquiry behaviors. Based on the previously discussed concept of inquiry, the Nova Research Team listed 12 classroom behaviors that facilitate and encourage student inquiry. Twelve statements were formulated from these behaviors to determine teacher attitudes toward teacher-student interaction conducive to inquiry. The questionnaire yields a composite score which is the sum of the responses on a five-point, Likert-type, agree-disagree scale.

3. Torrance Tests of Creative Thinking (TTCT)

Verbal Tests, Forms A and B were used. This instrument purports to measure the person's ability to "think up new ideas, use...imagination and solve problems" (Torrance, 1966, p. 5). The subtests of the verbal form are: asking, guessing causes, guessing consequences, product improvement, unusual uses, unusual questions, and just suppose. Three scores are derived for each

subtest: fluency, flexibility and originality. In addition, a composite score is obtained which is the sum of the three subtest scores.

4. Processes Of Problem Solving (POPS)

This instrument is the Processes of Science Test developed by the Biological Sciences Curriculum Study (1962). The name was changed in this study to be less threatening to teachers having little training in science. It purports to measure the subject's ability to use inquiry skills in solving problems by using available data and making inferences by going beyond the data given. The test yields a composite score which is the number of correct responses.

5. Teacher Practices Observation Record (TPOR)

This instrument was developed by Brown, et al. (1968). It purports to measure a teacher's overt "classroom behavior by systematic observation. It attempts to measure agreement-disagreement of teachers' observed classroom behavior with educational practices advocated by John Dewey in his philosophy of experimentalism (Brown, et al., 1968, p. 1)." This instrument was adopted because it required little observer training for acceptable use and also appeared useful for measuring observable classroom inquiry-related behaviors. Seven TPOR scale scores are obtained: A. Nature of the situation; B. Nature of the Problem; C. Development of Ideas; D. Use of Subject Matter; E. Evaluation; F. Differentiation; G. Motivation, Control. In addition, a total TPOR score is obtained by summing the seven scales.

THE SAMPLE

Description of Sample

Thirty elementary teachers in the public schools of Duval County, Florida participated in this study. All thirty participants were female. The ages ranged from less than 25 years to more than 55 years, with the median age being between 36 and 40 years. Years of teaching experience ranged from less than one year to 31 years, with the median years of teaching experience being between 5 and 10 years. Twelve of the teachers were black and eighteen were white. All teachers held at least a bachelor's degree and were certified to teach in the State of Florida.

Selection of Sample

The sample of thirty teachers was selected by Duval County school administrators. The ten IMPACT teachers and ten alternates to be trained by the prime contractor were selected by the following criteria:

1. willingness to participate,
2. flexibility,
3. capacity for innovation,
4. desire to be trained in scientific heuristics, and the
5. ability to become skilled in teaching via the inquiry method.

The other ten teachers were selected primarily on their willingness to participate in the study herein reported.

RESEARCH DESIGN

Constraints on the Design

Several aspects of the Duval County Project placed constraints on the research design and the statistical methods which could be used to analyze the data. First, the size of the sample was small. The study began with 30 teachers in three groups: ten workshop participants, ten workshop observers, and ten teachers not connected with the workshop. Second, the selection of teachers for the three groups was not on a random basis from the population of teachers in Duval County, nor were any special attempts made to form matched groups based on relevant criteria.

It should, of course, be kept in mind that the primary purpose of Project IMPACT involved the raising of the academic achievement level of the students involved. The achievement of this purpose was not dependent upon the conditions of random sampling or matched groups of teachers. The assessment of the teacher changes which occurred during Project IMPACT was an independent study, outside of the conditions of the performance contract. Therefore, while it was an unfortunate circumstance that the teacher sampling procedures were not better suited to the needs of this assessment, it is the task of the researcher to make the best of those conditions over which he has no control.

A third constraint placed upon this study was that the study should not in any way interfere with the teacher training

workshop or the subsequent inservice training of the teachers. For example, time for assessments related to this study could not be taken from the workshop or the teacher's instructional time during the period from the end of the workshop in January to the end of school in June. Therefore, all testing of the teachers was conducted after regular school hours. The contractor did grant permission for the Nova Research Team to make observations in the Project classrooms on three occasions.

Another constraint placed upon the research design was that the number of observers was small, the four members of the Nova Research Team, and therefore it was not possible to make observations in the classrooms of all 30 sample teachers during each of the three observation sessions. Observations of classroom behaviors could be made only on the ten Project IMPACT teachers during each observation session.

The first two constraints, small sample size and lack of randomness in sampling, place severe limitations on the generalizations which may be reached from this study. It should therefore be emphasized that the results of this study are largely descriptive of the teachers and circumstances of Project IMPACT and may or may not be generalizable to other teachers in other such projects.

Design

The design was formulated with the basic purpose of assessing teacher changes in inquiry related attitudes, abilities, and

behaviors over the period of the teacher training workshop and the subsequent inservice training. Due to the previously discussed sampling limitations, the use of a design allowing inferential, group statistical techniques seemed inappropriate. Therefore, the design utilized descriptive techniques.

Three groups of teachers were specified:

1. The group of 10 teachers who actually participated in the teacher training workshop and continued in the Project IMPACT Program to its completion in June were designated as the P (Project IMPACT) Group.

2. The group of 10 teachers who were observers during the workshop but returned to their previous classroom situation (Non-Project IMPACT) for the remainder of the school year were designated as the O (Observer) Group.

3. The group of 10 teachers who had no formal contact with Project IMPACT at any time were designated as the NP (Non-Project IMPACT) Group.

The data collection techniques fell into three catagories: (1) paper and pencil testing of the teachers to measure inquiry related abilities and attitudes; (2) observation of teacher-student interaction in the classroom related to behavioral aspects of inquiry; and (3) informal interviewing of the teachers related to their experience in Project IMPACT. The instruments used in the data collection have been described in a previous section of this report.

The paper and pencil instruments were administered to all three groups at the same time. Coded identification numbers were used to assure anonymity of the teachers. Only group P was included in the classroom observations. While the primary concentration of the informal interviews was on group P some teachers from groups O and NP were also interviewed.

The paper and pencil testing and the classroom observations were conducted three times during the term of the performance contract: once on January 5 and 6, preceding the teacher training workshop; once on February 16 and 17, following the workshop; and once on May 5 and 6. The informal interviewing was not precisely scheduled and took place with some teachers during each period of testing and observation. All P Group teachers were informally interviewed during the last observation period in May.

The sequence of events in each of the three assessment periods took part of two days. The teachers were asked to assemble for testing at the Duval County School offices in Jacksonville at 3:30 p.m. on the scheduled days, that is, January 5, February 16 and May 5. The testing lasted until about 5:00 p.m. and included the Test of Creative Thinking and the Processes Of Problem Solving in each session. The teachers then took the remaining paper and pencil instruments home to be completed and returned to their respective school offices the following day. The instruments taken home included the "Teacher Biographical Information" form, taken only on the first round of testing and the instruments,

"What is an Ideal Child" and "Ideas About Teaching", both given on all three rounds of testing. The instruments returned to the school offices were then forwarded to the Nova Research Team.

Teachers absent from a testing session were given the tests by school personnel at a later date under conditions approximating the group testing session.

The classroom observations were conducted in the rooms of the 10 group P teachers on the day after each testing session, that is, on January 6, February 17, and May 6. Teachers made no special preparation for these observations. The 10 group P teachers were divided between the three target elementary schools, A.L. Lewis, Garden City, and Jacksonville Beach. All observations were conducted by the four members of the Nova Team, with one observer in each of the three schools and one observer traveling between schools and observing in all three schools during each observation period. The observers switched schools on each of the three observation periods so that each observer was in each of the three schools at least once during the three observation periods.

The informal interviews were conducted by the Nova Team members at any opportunity before or after the testing sessions and before school, during lunch periods or after school on observation days.

ANALYSIS OF RESULTS

Ideas About Teaching (IAT)

The test results from the instrument, Ideas About Teaching (IAT) are given in Table 1 and Figure 1. The observer group produced a higher mean score on the IAT in all testing sessions than the other two groups. Figure 1 indicates that the P Group and the O Group produced a greater rate of change in mean scores over time than did the NP Group. This can be seen by the steeper slopes of the P and the O Groups.

The means and standard deviations for each groups' test scores are listed in Table 1. The change in variability over the three test sessions among those who received the workshop treatment is notable. Among the P Group and O Group there was a tendency to start the project with a small deviation about the mean, produce the greatest deviation immediately after the workshop, but then decrease this deviation by the third test session. In other words, variability in workshop participants' ideas about teaching was greater immediately after the workshop than it was prior to the training or five months afterward.

Processes Of Problem Solving (POPS)

Table 2 and Figure 2 summarize the test results for the instrument, Processes Of Problem Solving (POPS). The chief pattern evident in these results may be seen in Figure 2 wherein the raw scores of the P Group are consistantly lower than the other groups.

Only the O Group produced gains in mean scores across all test sessions.

Table 2 gives the means and standard deviations for the POPS. The standard deviations of test scores showed gradually increasing variance among P and NP Groups. In contrast, the O Group had the lowest standard deviations and furthermore, these decreased over time.

TABLE 1

Means and Standard Deviations for
Ideas About Teaching Instrument

	Test 1		Test 2		Test 3	
	M	S.D.	M	S.D.	M	S.D.
Project (P Group)	42.1	3.6	47.0	6.6	48.7	3.5
Observer (O Group)	45.7	6.6	48.3	7.2	49.2	4.7
Non-Project (NP Group)	42.2	8.5	42.5	5.9	42.9	7.4

TABLE 2

Means and Standard Deviations for
Processes Of Problem Solving Instrument

	Test 1		Test 2		Test 3	
	M	S.D.	M	S.D.	M	S.D.
Project (P Group)	25.7	7.3	23.4	9.9	24.3	10.6
Observer (O Group)	26.8	5.3	28.0	4.5	30.6	3.5
Non-Project (NP Group)	27.8	6.5	29.5	7.6	28.5	8.1

Figure 1: Ideas About Teaching (IAT)

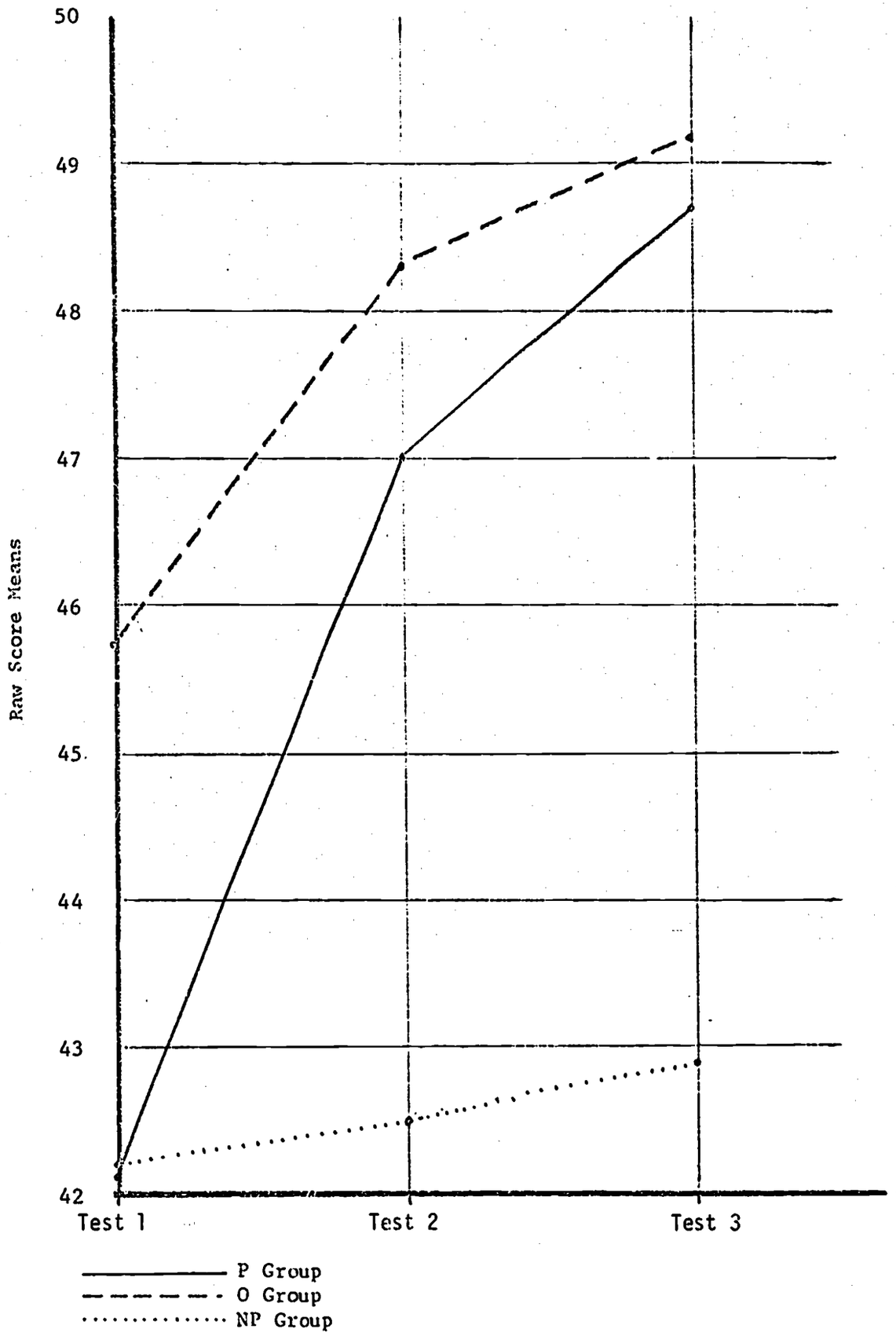
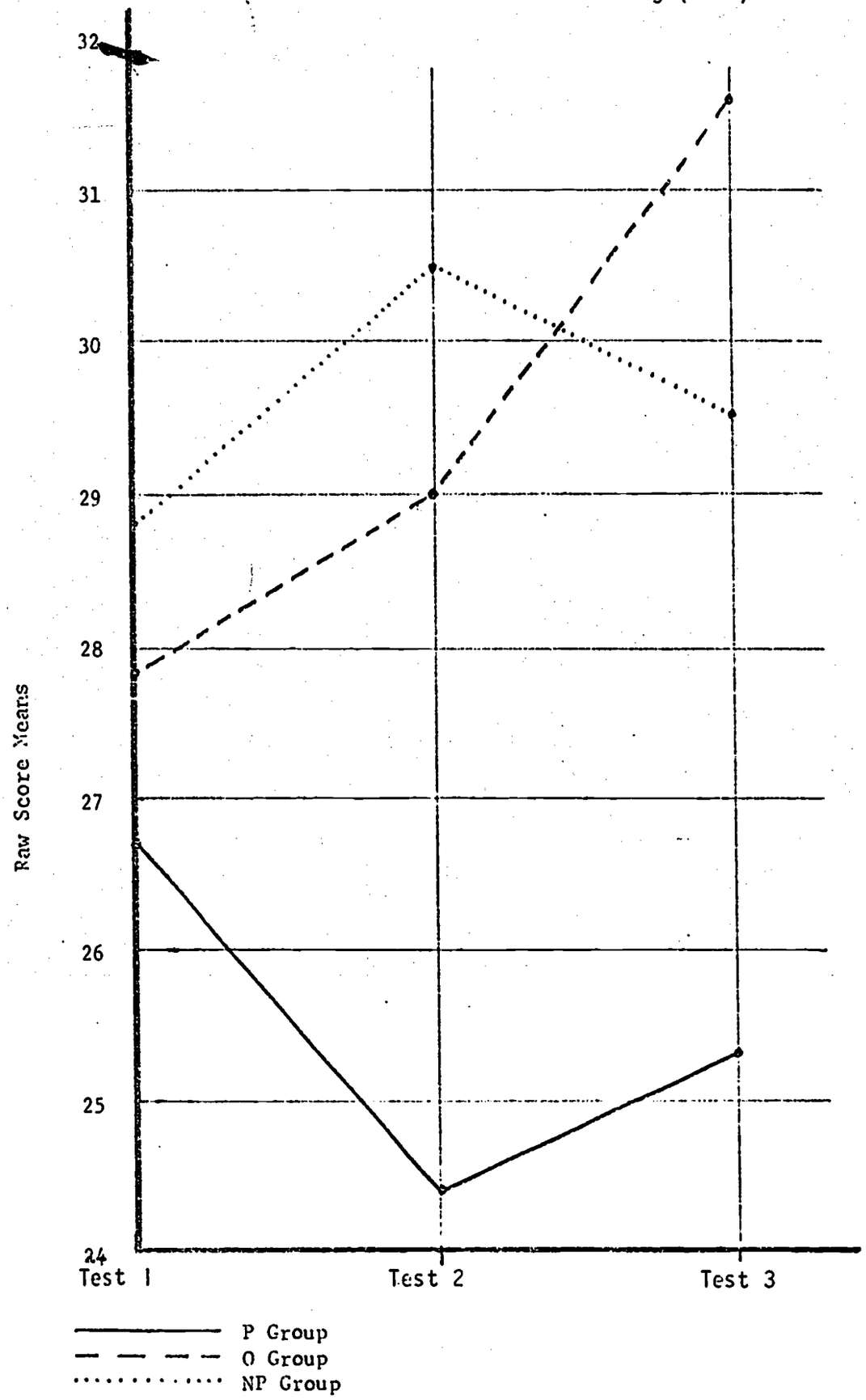


Figure 2: Processes of Problem Solving (POPS)



Torrance Tests of Creative Thinking (TTCT)

The test results from the instrument, Torrance Tests of Creative Thinking, are given in Table 3 and Figure 3. The O Group had the lowest mean score initially and the highest mean score at the end of the third testing session. The NP Group also showed a constant increase in mean score from testing session one to testing session three; however, the P Group showed a marked decrease in mean score from the first to the second testing session, but increased from the second to the third session to a point beyond which they initially started.

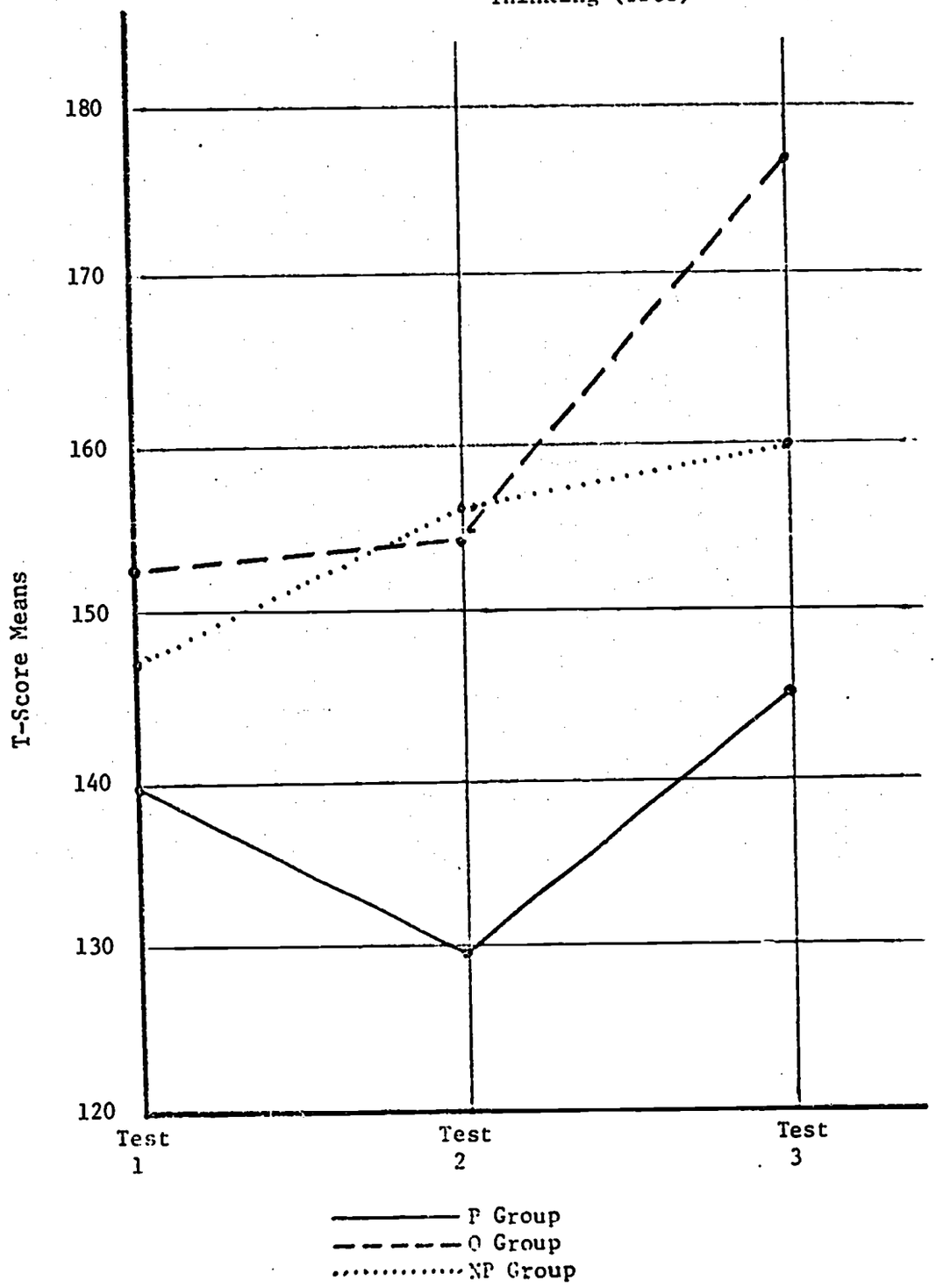
Means and standard deviations for each group's test scores are listed in Table 3. All groups decreased in variability from session one to session three. Only in the case of the O Group did their final variability remain at a level below their initial variability calculated from the first testing session.

TABLE 3

Means and Standard Deviations for
Torrance Tests of Creative Thinking

	Test 1		Test 2		Test 3	
	M	S.D.	M	S.D.	M	S.D.
Project (P Group)	139.1	21.1	129.6	14.2	145.0	36.4
Observer (O Group)	153.1	18.4	153.6	13.9	177.0	24.3
Non-Project (NP Group)	147.4	23.0	156.2	14.0	159.7	30.8

Figure 3: Torrance Test of Creative Thinking (TTCT)



What is an Ideal Child? (WIC)

The 65 items of the WIC were ranked according to their desirability to inquiry as judged by a panel of experts (c.f. Section on Selection of Instruments). For this analysis, the rankings of the items by each of the three groups of teachers were compared to the rankings of the items by the experts.

The results of the correlation analysis comparing the teachers' rankings of items to the experts' rankings of items are shown in Figure 4. The correlations with the experts' rankings for all three groups of teachers are identical on the pretest, being .48 for each group. On the second testing session, just after the workshop, the correlations indicate that the teachers taking part in the workshop as participants (P Group) or observers (O Group) are slightly more in agreement with the experts' rankings than are the NP Group which was not exposed to the workshop. The P Group correlation has risen to .50 and the O Group correlation has risen to .56 while the NP Group has risen to .49. The difference in groups becomes more pronounced on the third testing session. For that session, the P Group correlation is .54, the O Group correlation is .64, and the NP Group correlation is .41.

Further insight into the nature of the results on this instrument may be gained by examining some of the individual items. Exmainations of the top ten items in the ranking by the panel of

experts and the rankings given these same ten items by the teachers, provides information beyond that given by the correlations. Table 4 compares the rankings of these ten items for the three groups of teachers over the three testing sessions.

Items #31 (Initiative), #24 (Good guesser), #37 (Persistent), and #65 (Willing to take risks) all show rather low rankings by all three teachers' groups over all three testing sessions. All groups held a particularly low opinion of a child's being a good guesser or being willing to take risks.

Items #29 (Independent in thinking) and #28 (Independent in judgement) show patterns of change which are similar over the three testing sessions. For the P Group, these two items were ranked very high on the first and second testing sessions and then went down somewhat in the rankings on the third testing session. For both the O Group and the NP Group, these two items tended to be ranked more favorably on the second testing session than on the first. The ranking continued to increase from the second to the third testing session, with a slightly larger overall increase in ranking by the NP Groups.

Item #13 (Curious) was ranked very high by both the P Group and the O Group in all but one instance: the rank going down somewhat for the P Group on the second testing session but recovering a high position on the third testing session. This item was given a fairly high ranking by the NP Group on the first testing session, increased to a very high ranking on the second

testing session, but then decreased to a low ranking (41.5) on the third testing session.

Item #4 (Always asking questions) was ranked in the upper half of the 65 items by all groups on all testing sessions, but was not generally given very high rankings.

Some of the items not given high rankings by the judges were given high rankings by the teachers. Item #8 (Considerate of others) received consistently high rankings by the teachers, although it was ranked 44.5 by the experts. Item #26 (Healthy) also received consistently high rankings by the teachers but a 29.5 rating by the experts.

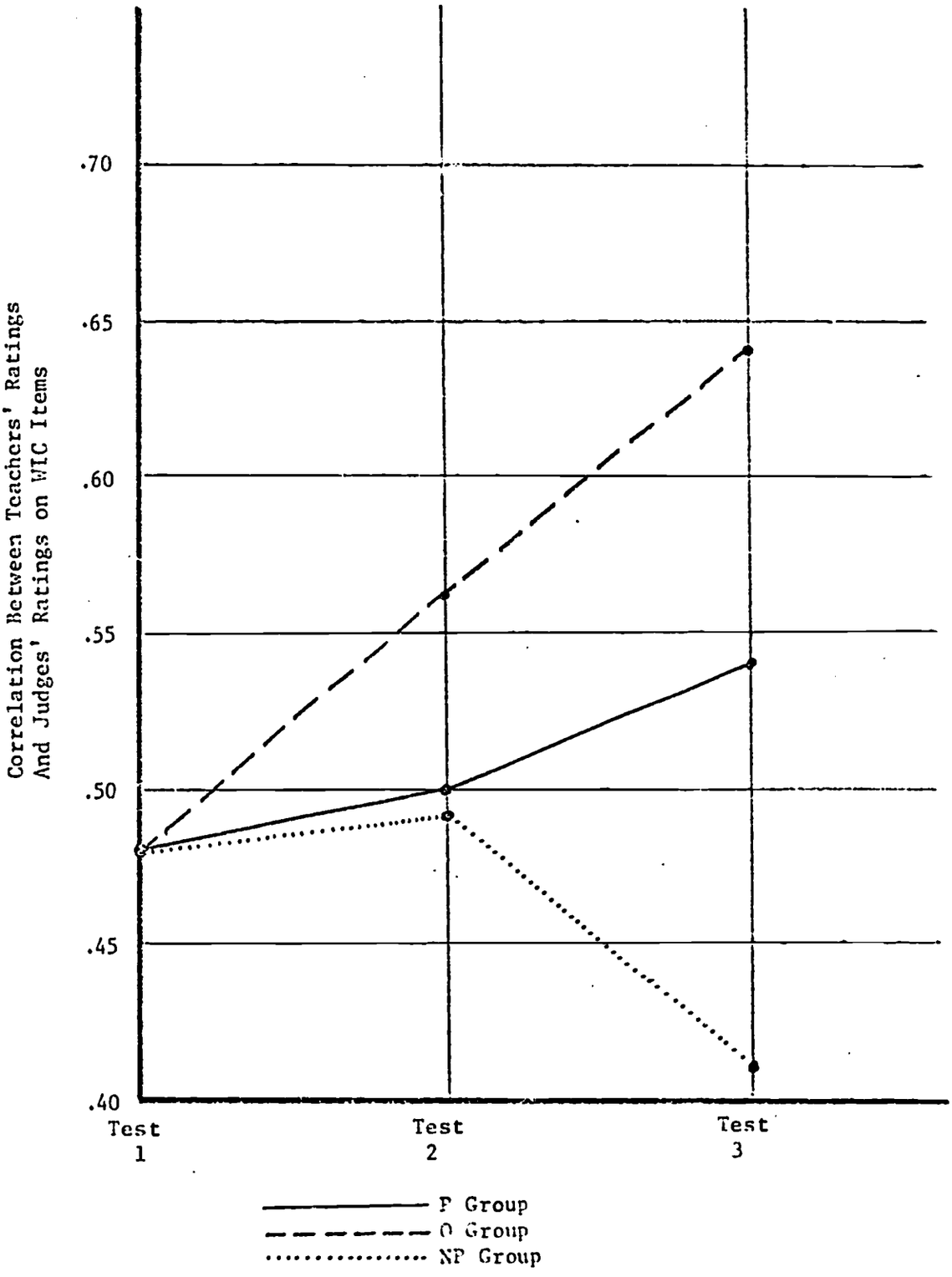
This instrument was able to detect changes in the teachers' responses due to participation in the workshop and subsequent in-service training. The O Group showed the greatest gains on this instrument. The next highest gains were made by the P Group teachers. The NP Group actually showed an overall loss on this instrument.

TABLE 4

Comparison of Rankings
of Top Ten Inquiry Items.

	Judges Ranking	P Group Test 1	P Group Test 2	P Group Test 3	O Group Test 1	O Group Test 2	O Group Test 3	NP Group Test 1	NP Group Test 2	NP Group Test 3
#31 Intuitive	1.0	35.5	14.0	22.0	25.0	41.0	27.5	29.0	35.5	46.0
#29 Independent in Thinking	2.0	7.0	1.0	11.5	1.0	4.0	1.0	14.0	5.5	13.0
#13 Curious	3.5	4.0	20.5	4.0	6.0	4.0	6.0	14.0	5.5	41.5
#48 A Self Starter	3.5	10.5	14.0	11.5	25.0	2.0	15.0	21.5	21.5	26.0
#28 Independent in Judgement	5.0	4.0	2.0	11.5	12.5	1.0	2.0	36.5	13.0	13.0
#4 Always Asking Questions	6.0	10.5	42.5	41.0	17.5	13.5	21.5	14.0	21.5	26.0
#24 Good Guesser	7.5	58.0	60.0	59.0	62.5	61.5	56.0	36.5	51.5	46.0
#37 Persistent	7.5	31.0	27.0	22.0	17.5	22.5	27.5	36.5	28.5	13.0
#5 Attempts Difficult Tasks	9.0	17.0	8.0	22.0	17.5	8.5	6.0	7.0	5.5	13.0
#65 Willing to take Risks	10.5	52.0	54.5	36.0	54.0	50.0	33.0	55.5	51.5	36.5
#27 Honest, Etc.	10.5	2.0	8.0	2.0	3.0	4.0	6.0	2.0	5.5	13.0

Figure 4: What is the Ideal Child (WIC)



Teacher Practices Observation Record (TPOR)

Table 5 shows the amount and direction of change in the seven subscales as well as of the total score of the Teacher Practices Observation Record (TPOR).

In Table 5, the column labeled Test Interval identifies the period of observation (interval 1-2, first observation to second; interval 2-3, second observation to third; interval 1-3, first observation to third). The next seven columns (A-G) identify the amount and direction of change in an individual teacher's score on that subscale of the TPOR. The last column (TPOR Tot.) shows the amount and direction of change in the teacher's total TPOR score for each test interval. For example, teacher 1 shows an increase of 11 points on scale D from the first observation to the second; thus, she demonstrated an increase of 11 points in the scale measuring Use of Subject Matter from the observation made prior to the training program to the observation made shortly after the training program.

Of the ten P Group teachers, seven obtained higher scores on the TPOR shortly after the training program. Five of the teachers showed a decrease in the TPOR score from the second to the third observation and those teachers changing in the positive direction showed only small increases.

TABLE 5

TPOR Changes

Teacher #	Test Interval	Scale A	Scale B	Scale C	Scale D	Scale E	Scale F	Scale G	TPOR Tot.
1	1-2	0	+ 8	+37	+11	+32	+12	- 6	+104
	2-3	+ 3	+ 3	- 6	+ 4	- 4	+ 5	- 1	+ 5
	1-3	+ 3	+11	+31	+15	+28	+17	- 7	+109
2	1-2	+ 2	+ 5	+13	+ 8	+19	+11	+ 7	+ 65
	2-3	-10	+ 4	-12	+ 9	-17	-14	-15	- 55
	1-3	- 8	+ 9	+ 1	+17	+ 2	- 3	- 8	+ 10
3	1-2	0	+10	- 1	-15	+17	- 1	+14	+ 24
	2-3	+ 9	- 3	- 5	+16	-13	+ 6	+ 4	+ 14
	1-3	+ 9	+ 7	- 6	+ 1	+ 4	+ 5	+18	+ 33
4	1-2	+18	+23	+ 9	+11	+20	- 7	+13	+ 84
	2-3	+ 3	- 9	-11	- 2	- 5	+12	- 7	- 18
	1-3	+21	+14	- 2	+ 9	+15	+ 5	+ 6	+ 66
5	1-2	Not Present for observation #2.							
	2-3	"	"	"	"	"			
	1-3	+16	+ 9	+42	+33	+35	+ 7	- 4	+129
6	1-2	+ 7	+ 9	+15	+ 8	+31	+ 3	+17	+ 90
	2-3	+ 9	-10	-10	- 4	-18	- 1	- 8	- 42
	1-3	+16	- 1	+ 5	+ 4	+13	+ 2	+ 9	+ 48
7	1-2	+ 2	- 8	-13	-11	-13	-13	+ 2	- 64
	2-3	-24	- 7	+ 2	- 8	+ 1	- 1	- 9	- 46
	1-3	-22	-15	-11	-19	-12	-14	- 7	-100
8	1-2	+ 5	+22	+15	+ 4	+35	+ 4	+12	+ 97
	2-3	+ 3	-20	- 6	- 4	-12	+ 1	- 2	- 27
	1-3	+ 8	+ 2	+ 9	0	+23	+ 5	+10	+ 70
9	1-2	+ 7	+25	+ 3	+11	+ 9	- 6	+20	+ 53
	2-3	+ 2	- 9	+ 9	+16	+ 4	+17	- 4	+ 35
	1-3	+ 9	+16	+12	+27	+13	+11	+16	+108
10	1-2	+ 4	- 6	-18	+ 8	+ 4	+ 1	+ 5	- 1
	2-3	Not Present for observation #3.							
	1-3	"	"	"	"	"			

The greatest positive change in the TPOR scores occurred between the first observation and the second observation. The least amount of positive change occurred between the second observation and the third observation (Table 6 and Figure 5). However, as a group, the teachers showed a positive gain from the first to the third observation period.

Figure 6 shows the correlations between the WIC and the TPOR subscales. While on the first testing session subscale D (Use of Subject Matter) obtained one of the lowest correlations (-.48) with the WIC, by the third session, the correlation was the highest of all subscales (.76). All of the subscales except G (Motivation, Control) achieved higher correlations with the WIC on the third testing session than on the first.

Subscale F (Differentiation) correlated .07, -.48 and .32 respectively with the WIC for the three testing sessions. The lowest correlation was obtained on the second testing session.

Table 6

TPOR Means and Standard Deviations

	Mean	Standard Deviations
Observation 1 N=10	167	37.6
Observation 2 N=9	208	35.1
Observation 3 N=9	223	46.3

Figure 5: Teacher Practices Observation Record (TPOR) Means for the P Group

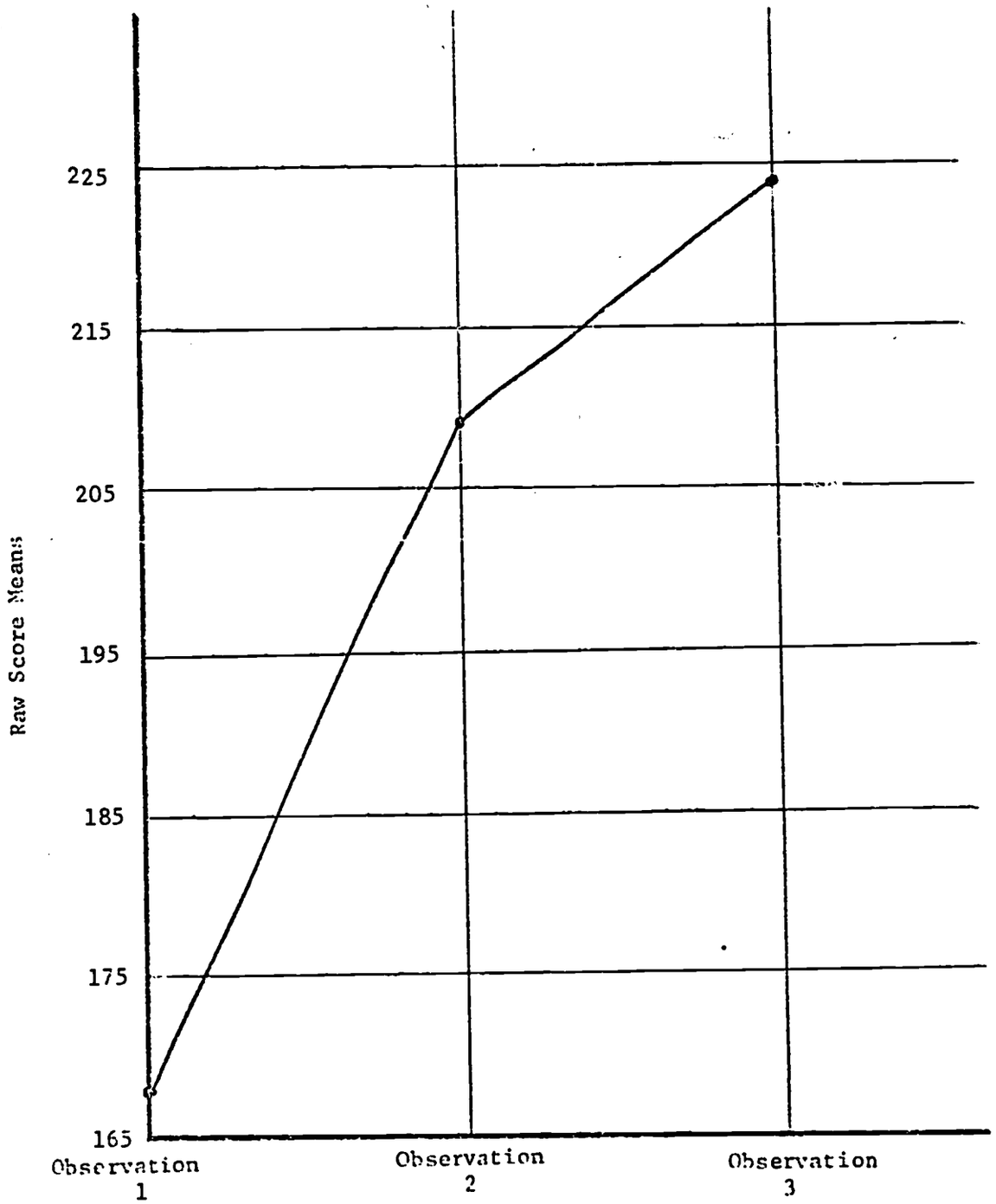


FIGURE 6

P Group Correlations Between WIC and TPOR
Subscales for Three Observation Sessions

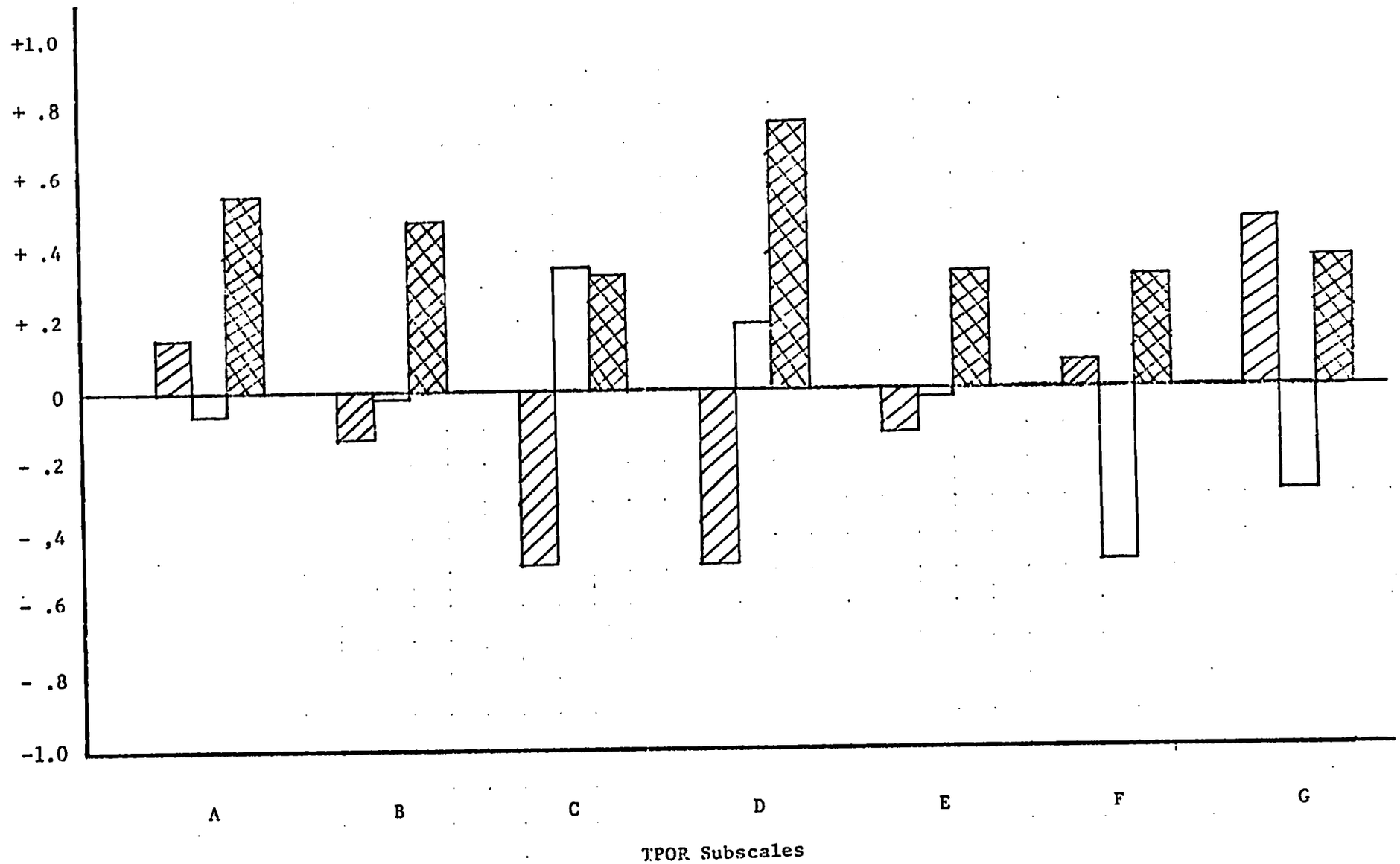


FIGURE 7
P Group Correlations Between IAT
And TFOR Subscales Over Three
Observation Sessions

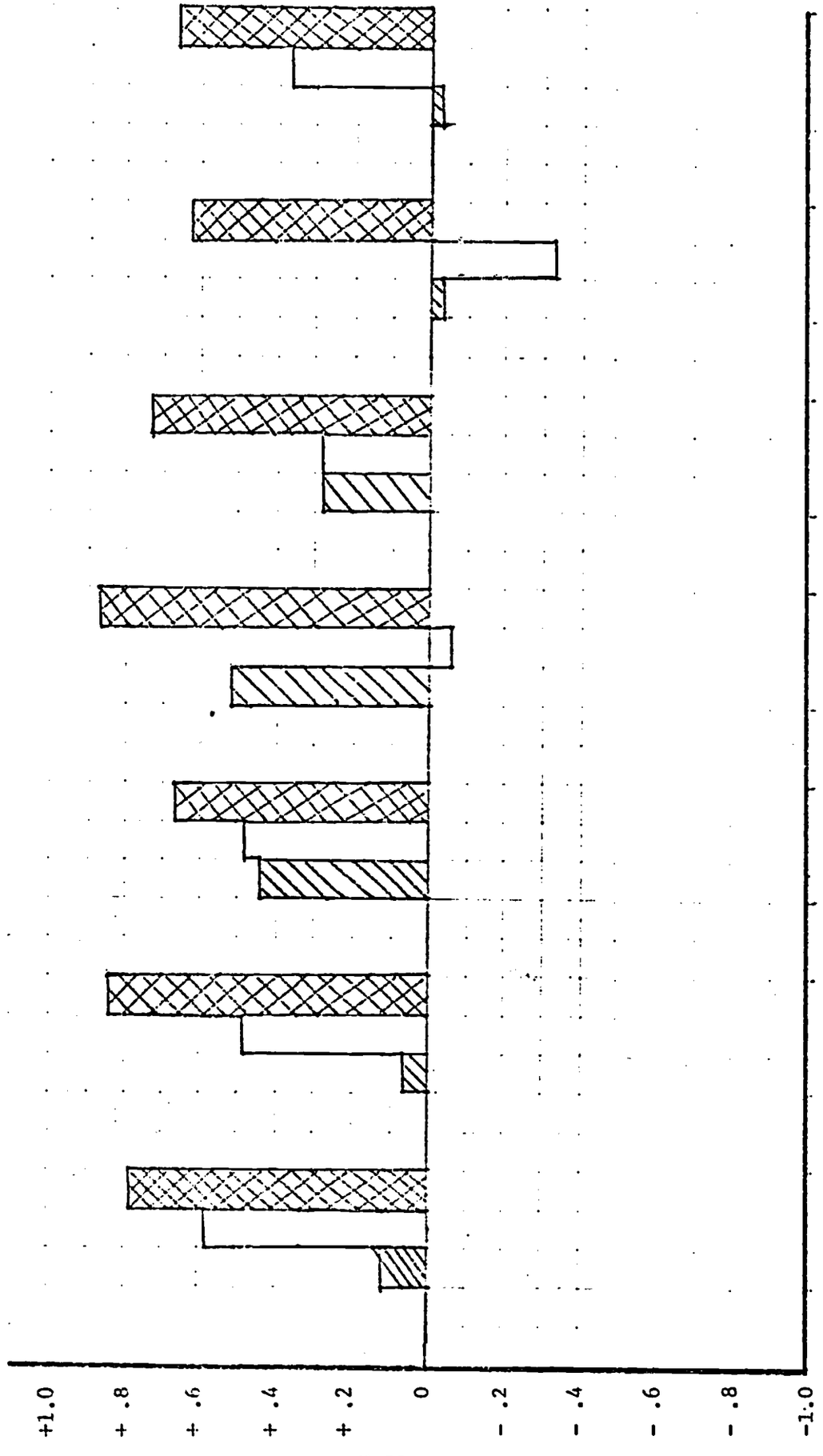


Figure 7 shows the correlations between the IAT and the seven subscales of the TPOR. As in Figure 6, the highest correlation obtained between the attitude measure (IAT) and the behavior measure (TPOR) is between subscale D and the IAT (.88). While the third testing session showed the highest correlation between subscale D and IAT, the second showed the lowest (-.05).

All subscales show higher correlations with the IAT on the third testing session than on the first.

Analysis of Instrument Intercorrelations for All Groups

Table 7 shows the intercorrelations between the POPS, TTCT, IAT, and WIC for all three test sessions. Of the six correlations possible, in every instance the correlation increased between test session one and session three. In five of the six correlations, the correlation coefficients more than doubled between the first and third test session.

The range of the intercorrelations for each test session decreased over time. The range of the first test session was between -.17 to +.45; for the second test session the range was -.08 to +.52; and finally the range for the third test session was reduced to +.45 to +.71.

The greatest increases in correlations occurred between IAT and TTCT (increasing from -.10 to +.65) and between the WIC and TTCT (increasing from -.11 to +.70). The least increase in correlations occurred between the IAT and the POPS. Here the correlation increased only from .45 to .55.

TABLE 7

Changes in Instrument
Intercorrelations Among P Group,
O Group, and NP Group

Test 1 Intercorrelations (N=30)

	POPS	TTCT	IAT	WIC
POPS	1.00	.24	.45	-.17
TTCT		1.00	-.10	-.11
IAT			1.00	.20
WIC				1.00

Test 2 Intercorrelations (N=30)

	POPS	TTCT	IAT	WIC
POPS	1.00	.39	.12	.52
TTCT		1.00	-.08	.16
IAT			1.00	.07
WIC				1.00

Test 3 Intercorrelations (N=29)

	POPS	TTCT	IAT	WIC
POPS	1.00	.71	.55	.45
TTCT		1.00	.65	.52
IAT			1.00	.70
WIC				1.00

Analysis of Instrument Intercorrelations for the P Group

Table 8 shows the intercorrelations among POPS, TTCT, IAT, TPOR, and WIC for the three testing sessions. The largest intercorrelations appear in the third testing session for the majority of the instruments. Only one correlation of high magnitude appears in the data for the second testing session between the WIC and the POPS. The highest correlation between any two instruments occurs in the data for the third testing session between the IAT and the TPOR. There appears to be a constant increase in intercorrelation from the beginning to the end of the project. The largest final change in correlation is found between the IAT and WIC. The smallest final change in correlation is found between the POPS and the TTCT.

It would appear that the variables intercorrelate to a much greater degree for the third testing session than for the other testing sessions.

TABLE 8

Changes in Instrument
Intercorrelations for P Group

Test 1 Intercorrelations (N=10)

	POPS	TTCT	IAT	TPOR	WIC
POPS	1.00	.30	.37	.27	-.21
TTCT		1.00	.27	.36	.40
IAT			1.00	.28	-.13
TPOR				1.00	-.08
WIC					1.00

Test 2 Intercorrelations (*N=10)

	POPS	TTCT	IAT	TPOR	WIC
POPS	1.00	.46	.06	-.14	.80
TTCT		1.00	-.10	.21	.46
IAT			1.00	.06	.24
TPOR				1.00	-.19
WIC					1.00

Test 3 Intercorrelations (N=9)

	POPS	TTCT	IAT	TPOR	WIC
POPS	1.00	.66	.66	.48	.54
TTCT		1.00	.79	.72	.69
IAT			1.00	.85	.81
TPOR				1.00	.50
WIC					1.00

*One teacher was not observed; therefore, the mean score for the other two observations of this teacher was assigned for purposes of analysis.

DISCUSSION OF RESULTS

Discussion of IAT Results

The effect of the workshop on teachers' ideas about teaching is demonstrated in two ways by the data (Table 1, Figure 1). First, the general increase in means on the instrument during the project indicates a greater acceptance of inquiry-oriented teaching by the 20 workshop teachers (P and O Groups). This was not true of the Non-Project Group, thus indicating that the workshop treatment had a positive effect. In addition to increased means, the fact that workshop teachers variability decreased over time could also indicate that the inservice activities had a positive effect in producing group agreement about their attitudes toward inquiry teaching. It is interesting to note that the pattern of change in the standard deviations for the NP Group is exactly the mirror image of the standard deviations produced by the workshop teachers. Thus it would appear that teacher attitudes toward inquiry teaching have changed positively as a result of the in-service activities.

Discussion of POPS Results

Specific patterns in the POPS results are difficult to discern (Table 2, Figure 2). Gains in means occurred among workshop teachers (both P and O Groups) only during the period of follow-up activities. However, the variability increased in the P Group, whereas it decreased in the O Group.

The POPS test measures the application of scientific processes among examinees. Since the processes measured are fairly sophisticated, change in teacher performance may only be slight if training was not emphasized in this area. This seems to be the case in this project where teacher sophistication in these areas was not necessarily that important to creating classroom environments that encourage student inquiry. One goal of the teacher training was that "teachers will learn to apply their knowledge and skills in the strategies to the teaching of mathematics, reading, writing, science, and social studies and to integrate these inquiry based strategies with the instructional materials selected for each content area." It is possible that a highly knowledgeable person in inquiry would not be able to meet this objective. Similarly, one who has only a basic knowledge in this area might be able to create an exciting inquiry setting. Hence, the usefulness of this instrument in this study is doubtful. The Nova Research Team had to rely more heavily on the other measures to describe the effectiveness of the inservice training in Project IMPACT.

Discussion of TTCT Results

The decrease in mean on the TTCT (Table 3, Figure 3) for the the P Group from the first to the second testing session and the large increase in mean from the second to the third testing session may indicate that there was an adjustment period needed with the new material and inquiry-related techniques in the classroom

However, experience in the usage of the materials between the second and third testing sessions seems to have altered teachers' attitudes and behavior related to the use of materials and individualization of instructions to a point well above the first session.

Discussion of Instrument Intercorrelations

The increase in intercorrelations among the instruments over the three test sessions indicates the test battery is reasonably cohesive. That is to say, the level of intercorrelations suggests the instruments may be measuring aspects of the same entity or factor--a factor which the Nova Team chooses to call inquiry. Although the sample size did not meet the assumptions necessary for factor analysis, the intercorrelations do suggest that a common factor is operating across the instruments. Thus a teacher having a high creativity score in the TTCT would be expected to accept inquiry teaching strategies in the classroom, as measured by the IAT. Similar statements can be made about the apparent relationship of the other instruments.

SUMMARY AND IMPLICATIONS

This study investigated features of Project IMPACT which are not found in most projects involving performance contracting. First, Duval County was the first district to prepare their own RFP (Request for Proposal). Second, the contractor agreed to meet the conditions, stated by the Duval County Schools, that the teacher training program emphasize the use of inquiry techniques in teaching and that the subsequent teaching of the 300 target students would be by the inquiry method. Third, this project marked the first attempt by a contractor to train locally employed teachers to take the responsibilities for the classroom instruction.

Many teachers have felt threatened by the aspect of performance contracting which has been traditionally followed - that is, using personnel from outside the school system to teach the students. With a successful project for teachers who are already within a school system, performance contracting may increase in acceptance by the teaching profession since it will enable teachers to effectively teach their students by using the most current curriculum materials and the most stimulating strategies.

Were there advantages to the contractor, the schools, the teachers or the students due to the unique features of Project IMPACT mentioned above?

It is the considered opinion of the Nova Research Team that there were advantages for each of these groups due to the unique

features of Project IMPACT. The children reached an improved level of achievement but with the added advantage of having a local teacher, familiar with their backgrounds and families. The Project teachers had an opportunity for leadership positions in addition to the satisfaction of seeing students, who were chronic underachievers, achieve in an acceptable manner. The school system benefited from having its own teachers' participate in a performance contract since a turnkey process could be instituted. Teachers that have the experience, the inservice training and have tried the new methods in their classroom could train new teachers in the theory and use of materials--decreasing the net cost to the school system. It was of benefit to the performance contractor to use teachers within the system since information about the project could be more easily communicated. The contractor also received the added advantage of fostering good relations with the teaching profession.

How can the contractor train local teachers to assure project success within the unique features of his contract?

Specific training objectives had been established for Project IMPACT teachers (see Section, Selection: Sample). Was it possible to select teachers for training in specific objectives to assure maximum project success?

The contractor specified the criteria for teacher selection and the school system selected the teachers for participation in the project. The typical project teacher selected was female, had between 5 and 10 years teaching experience, was between 36 and 40 years old, was trained in elementary education, and felt her

training in the four subject matter areas to be adequate but not excellent.

The major focus in the workshop seems to have been on the use of inquiry strategies with specific subject matter materials. The use of specific inquiry-related instructional materials provided a structure in which workshop participants could develop the skills of inquiry teaching.

In assessing the inservice training program, the Nova Research Team identified three major areas of investigation: changes in teacher inquiry-related attitudes, inquiry-related abilities and inquiry teaching behaviors. The workshop seems to have had an effect on the three areas. Teacher growth in observed inquiry-teaching behavior seems to have been accompanied by growth in inquiry-related attitudes and abilities.

What characteristics of the workshop itself may have accounted for the apparent success in training teachers to use inquiry teaching methods?

Three approaches used in the workshop were apparently successful: demonstration by consultants of inquiry strategies with the new materials, use of the strategies and materials by the teachers in groups with other teachers, and then, use of the strategies and materials by the teachers with children. The follow-up activities provided continuing reinforcement to the teacher in the use of the new skills. Informal interviews with project teachers indicated, that in spite of some frustrations, they were very gratified by the responses to the new program by

children, parents and school personnel.

The Nova Research Team came away from Jacksonville with a variety of impressions. These impressions were formed not only from the observations made in the three project schools, but also from the informal conversations with teachers, administrators and project staff. As with so many innovative projects in education, the degree of satisfaction with the program's success seemed to vary from teacher to teacher. The research team felt that school climate and style of the principal's leadership might be important variables in the project - the importance of which future research should attempt to clarify.

Major changes in classroom operations were apparent over the five month period of this study. The most obvious change observable was the movement toward individualized instruction. Fewer large group lessons were observed and those that were observed had a much greater orientation toward student inquiry than before the inservice activities. Generally speaking, classroom organization moved toward an "open space" approach to instruction, that is, from teacher-centered instruction to student-centered instruction. However, much more progress could be made in this area.

The excitement generated by teachers and students working with new materials and techniques was evident in the observations. Student motivation was so high in some lessons observed that teachers seemed to have difficulty coping with student responses of increased noise levels, physical movement and individual

demands for teacher attention. Increased motivation and changed classroom settings might have been even more apparent in the observations had all learning materials and air conditioning been delivered when promised.

The unique "firsts" of Project IMPACT not only made it a pioneer in the field but also produced national visibility for its participants. Such visibility of good teaching practices is a definite strength of the project. Moreover, the turnkey features of the program expands the opportunities for teacher professional growth to take place by encouraging leadership and advancement. Both the teacher and the performance contractor benefit by cooperation in the educational endeavor. The contractor in this study was not merely an outsider coming in to do the teacher's job - he was a cooperative, supportive consultant, helping the teacher to do a better job.

SOME UNANSWERED QUESTIONS

1. Could Jacksonville have trained the teachers and achieved the desired student achievement as effectively as did the outside contractor, but at less cost?

2. How important was the selection process for the Project Teachers? Would the same results have been obtained if the Project Teachers had been randomly chosen from the teacher population of Duval County?

3. How do the teachers feel about "buying a packaged program"? i.e. how do they feel about having materials, teaching methods, and objectives dictated to them by a contract?

4. What should be the extent of the teachers' role in all phases of the performance contract, from RFP to final evaluation?

5. What training do teachers need to function in an effective manner in all phases of a performance contract as specified in the previous question?

6. Should the performance contractor be paid on the basis of teacher change as well as student change?

7. Is the contractor obligated to plan for legitimate research (for example random selection, random treatment, use of controls, etc.) into his program by an outside agency and to share successful techniques with the educational community?

8. Should performance contractors receive additional payment based upon the success of the turnkey operation, that is, a yearly bonus be paid based upon lasting, contractor produced, improvements?

9. Is an outside agent more effective than the local school system in producing changes within the schools?

REFERENCES

Baughman G. in Humphrey, B. Duval develops own school IMPACT program. Jacksonville Journal. October 19, 1970, pp. 19.

Biological Sciences Curriculum Study (BSCS). Processes of sciences test (Form A). New York: The Psychological Corp. 1962.

Brown, B., Mendehall, W. and Beaver, R. The reliability of observations of teachers' classroom behavior. The Journal of Experimental Education, 36(3), 1968.

ERIE: Cole, H. P. What is process education? An emerging rational position. Unpublished document from Eastern Regional Institute for Education, 1970.

Jenkins, D. H. The dynamics of instructional groups. 59th Yearbook, Part II, NSSE. Chicago: University of Chicago Press, 1960.

McRel: Amidon, E. J. and Flanders, N. A. The role of the teacher in the classroom. Minneapolis: Association for Productive Teaching, Inc., 1967.

McRel: Bingham, R. M. (ed.). Inquiry objectives in the teaching of biology. Kansas City: Mid-Continent Regional Educational Laboratory, 1969.

Torrance, E. P. Torrance tests of creative thinking; norms-technical manual. Princeton: Personnel Press Inc., 1966.

Torrance, E. P. Rewarding creative behavior. New Jersey: Prentice-Hall, Inc., 1965.

APPENDICES

APPENDIX A: Instruments

NOVA UNIVERSITY-DUVAL COUNTY EXPERIMENTAL RESEARCH PROJECT

Teacher Biographical Information

Name of School _____ Teacher Social Security # _____

There are a number of factors that contribute to a teacher's unique teaching style. We are interested in identifying some of these factors. We would appreciate your cooperation in completing the following items:

1. Years of teaching experience _____

2. Age: (circle one)

   20-25 26-30 31-35 36-40 41-45 46-50 51-55 56-60

3. Sex: Male _____ Female _____

4. Undergraduate major (s) _____ Institution _____

5. Undergraduate minor (s) (12 or more semester hours)

   _____

   _____

6. Highest degree obtained _____ Institution _____

7. How would you rate your preparation in these areas? (circle one)

Reading:	Excellent	Adequate	Inadequate	None
Social Studies:	Excellent	Adequate	Inadequate	None
Mathematics:	Excellent	Adequate	Inadequate	None
Science:	Excellent	Adequate	Inadequate	None

8. What does the term "inquiry teaching" mean to you? (If you need more space, please use the other side of this page.)

Name _____ School _____ NU: 71

Date _____

NOVA UNIVERSITY-DUVAL COUNTY EXPERIMENTAL RESEARCH PROJECT

Ideas About Teaching	1. Strongly Agree	2. Agree	3. Uncertain	4. Disagree	5. Strongly Disagree
1. Lively discussions are OK, but they always seem to get off the subject.	1	2	3	4	5
2. During discussions many student ideas are not useful because they do not contribute to the discussion.	1	2	3	4	5
3. The best way to teach problem-solving is to show the student how to solve problems.	1	2	3	4	5
4. Most students require teacher-guidance in their thinking.	1	2	3	4	5
5. Some students ask entirely too many questions.	1	2	3	4	5
6. During a group discussion, when a student asks a question, it is usually better for the teacher to answer it than for another student to answer it.	1	2	3	4	5
7. When several students are discussing a topic, it is important for the teacher to frequently add information and correct faulty ideas.	1	2	3	4	5
8. The student who stubbornly challenges the teacher's ideas is a real problem.	1	2	3	4	5
9. The student should be able to rely on the teacher to know the right answer.	1	2	3	4	5
10. It should be impressed upon students that guessing has no place in the classroom.	1	2	3	4	5
11. The overly curious student creates too many problems for the teacher.	1	2	3	4	5
12. Most students are incapable of finding evidence to support their ideas.	1	2	3	4	5

APPENDIX B: Schedule of Workshop Activities

Project IMPACT

In-service training schedule for Project IMPACT

Jacksonville Beach Elementary, #144

1st Week - January 11 - 15

Monday A.M.	Orientation to the week Awareness Experience - Classification Skills Analysis and Rationale for the Strategy
Monday P.M.	Tryout in teams using the teaching strategies for attending, observation and classification skills - Demonstration of the teaching strategies with children
Tuesday A.M.	Teachers try out strategies with children Discussion of tryouts Summary of the teaching strategies
Tuesday P.M.	Awareness Experience - Concept Development Analysis and Rationale for the Strategy Team Planning and Tryout of the Concept Development teaching strategy
Wednesday A.M.	Teachers tryout with children Analysis of tryouts Summary on Concept Development strategy
Wednesday P.M.	Awareness Experience - Interpretation of Data Analysis and Rationale for the Strategy Step by Step Review
Thursday A.M.	Team planning and tryout of the strategy Planning for tryout with children
Thursday P.M.	Teachers tryout with children Analysis of tryouts Summary of the Interpretation of Data strategy
Friday A.M.	Introduction to the teaching strategies for Application of Generalizations and Interpretation of Feelings, Attitudes, and Values
Friday P.M.	Introduction to the Taba Social Studies Curriculum - Analysis of the content and learning activities in the 1st grade unit

LB

Project IMPACT

In-service training schedule for Project IMPACT

Jacksonville Beach Elementary, #144

2nd Week - January 18 - 26

John Trivett - Consultant

Monday

Introduction: the approach and the Project IMPACT expectations, evaluation, objectives, discovery, cybernetic and the teacher's role, correction and non-correction, integration of all subject areas, etc.

Mathematics: use of rods for teachers' initial learning experience and its implications. Colored slides of first-grade children at work.

Reading: the first vowels and chart 0.
Visual dictation No. 1
Use of the pointer

Tuesday

A. L. Lewis Elementary, #105

Math: continuation of Monday's activity with rods, free play, descriptive phases. Introduction of attribute blocks: description, sorting games, inclusion, exclusion, complement, set, subset, element, etc.

Children's Lesson: Mr. Trivett and the first reading lesson.

Mr. Trivett and free play with the rods.

Teacher's Discussion

Reading: Teachers use pointers with each other.
Vowels and consonants
Book 1
Videotape showing early lessons

Wednesday

Math: Learnings from Monday and Tuesday activity patterns, systems, strategies, concepts known, addition and subtraction, confusion and clarity, environmental clues, etc.

Set games, union and intersection, equivalence using Attribute Blocks and pebbles

Children: Mr. Trivett with children on Chart 0; writing and reading Book 1
Rods, some games in qualitative phase

Teacher Discussion

Reading: Use of Book 1
Continuation of chart work, transformation games, beginnings of writing

Garden City Elementary School, #59

Thursday

Math: Patterns the children make.
Measuring to get numbers; the 'number facts', addition and subtraction.
Written symbols
Using rods, blocks, pebbles.

Children: Teachers work with small groups of children in both reading and math with guidance.

Reading: Use of Book 2
Spelling
Workbooks, worksheets, and early transformation.

Friday

Math: Relation games
Computational aspects
$+ \; - \; \times$ and $\div$
Factors and multiples
Inequalities

Children: Teachers with children on aspects arising from Thursday's work

Reading: Book of stories
Transformation games
The first 12 charts
Books 1 and 2

Third Week

Jacksonville Beach Elementary,#144

Monday	Recapitulation of beginnings in the light of what happened during previous week. Teachers spend time working with charts, with themselves and with children. Use of geo-boards in grade 1. Use of texts, work cards and word cards.
Tuesday	OPEN but must include discussion of problems of follow-up and arrangements for continuing follow-up, reporting, etc. Housekeeping details
Wednesday	Dr. David Butts - Science - A Process Approach
Thursday	Science - A Process Approach
Friday	Science - A Process Approach

12:00 Lunch

1:00 "Shapes, Shadows, and Children" (A session directed toward the teacher's background in space/time relationships.)

2:30 Informal discussion with Cokes

3:00 Decision time: Preparation for Low Ratio Teaching on Friday morning including
1) Selecting exercise
2) Planning to teach it
3) Exploration of materials needed

4:00 Adjourn

Friday, January 29

8:30 Continued preparation for Low Ratio Teaching

9:00 Low Ratio Teaching

10:00 Individual reflections on "What I learned from the last hour."

10:20 Informal discussion with coffee

10:40 Shared ideas on what the next month's activities with children should be.

12:00 Lunch

1:00 "Vegetables and Grouping" - a session directed toward teacher's background in classification

2:00 Questions and concern time

3:30 Adjourn

Jeanette Hazouri
Project IMPACT
1450 Flagler Avenue
Jacksonville, Florida 32207

KEY TEACHER IDEAS

A. THE STUDENT'S EXPERIENCES IN THE CLASSROOM

1. Do you let the student decide for himself rather than give him the criterion to look for?

2. Do you encourage the child to try out his suggestions rather than serve as the source of knowledge?

3. Do you let the child generate the basis of action rather than serve as the source of knowledge?

4. Do you take time to let the child grope, ponder, or mess around rather than direct him immediately to the conclusion?

5. Do you keep the children actively involved (either physically or mentally) rather than do the activity yourself?

6. Do you direct students in experiences prior to expecting analysis and meaning for words rather than presenting the vocabulary before the experience?

B. HOW THE STUDENT INTERPRETS HIS EXPERIENCES IN THE CLASSROOM

1. Do you respond to explanations with questions such as "how do you know" or "is it reasonable" rather than agree or disagree with the explanation?

2. Do you listen to student descriptions and push them for more precision rather than accept their first response?

3. Do you help students to question explanations in terms of reasonableness of their own experience rather than accept the reasonableness of your experience?

4. Do you recognize that one experience does not mean comprehension rather than assume because the point is clear to one, it is clear to all?

5. Do you select illustrations of an idea that progressively are less obvious than simpler ones rather than assuming that because the student saw the point in the simple illustration he sees it in all instances?

6. Do you make students back up and simplify complex statements so that other students comprehend rather than accept it because it sounds good or adequate to you?

C. TEACHER RESPONSES TO STUDENTS

1. Do you keep an open mind as to the student's response rather than accept only that answer you think is correct?

2. Do you direct student thinking by introducing situations that "don't fit" or that may be surprising rather than telling them that they don't see the point?

3. Do you adjust the pace of the exercise to the progress of the student rather than speed to cover it or drag to fill in the time?

4. Do you base your opinion of student performance on what you see him do rather than on what you assume he can do?

5. Do you pose questions to get students to think rather than to get the answer you think is correct?

6. Do you direct questions to the student's level rather than expect all students to operate at the same level of experience necessary to answer a question?

7. Do you probe the basis for an inappropriate response rather than tell the student he is wrong and then search for the desired response?

**DO YOU CONTINUALLY INVOLVE THE GROUP IN THE ACTIVITY BY PROVIDING OPPORTUNITY FOR THEM TO EXPRESS AN OPINION BEFORE DOING AN ACTIVITY RATHER THAN LET THE ACTIVITY BE A DEMONSTRATION MONOLOGUE BETWEEN THE TEACHER AND ONE OR TWO STUDENTS?